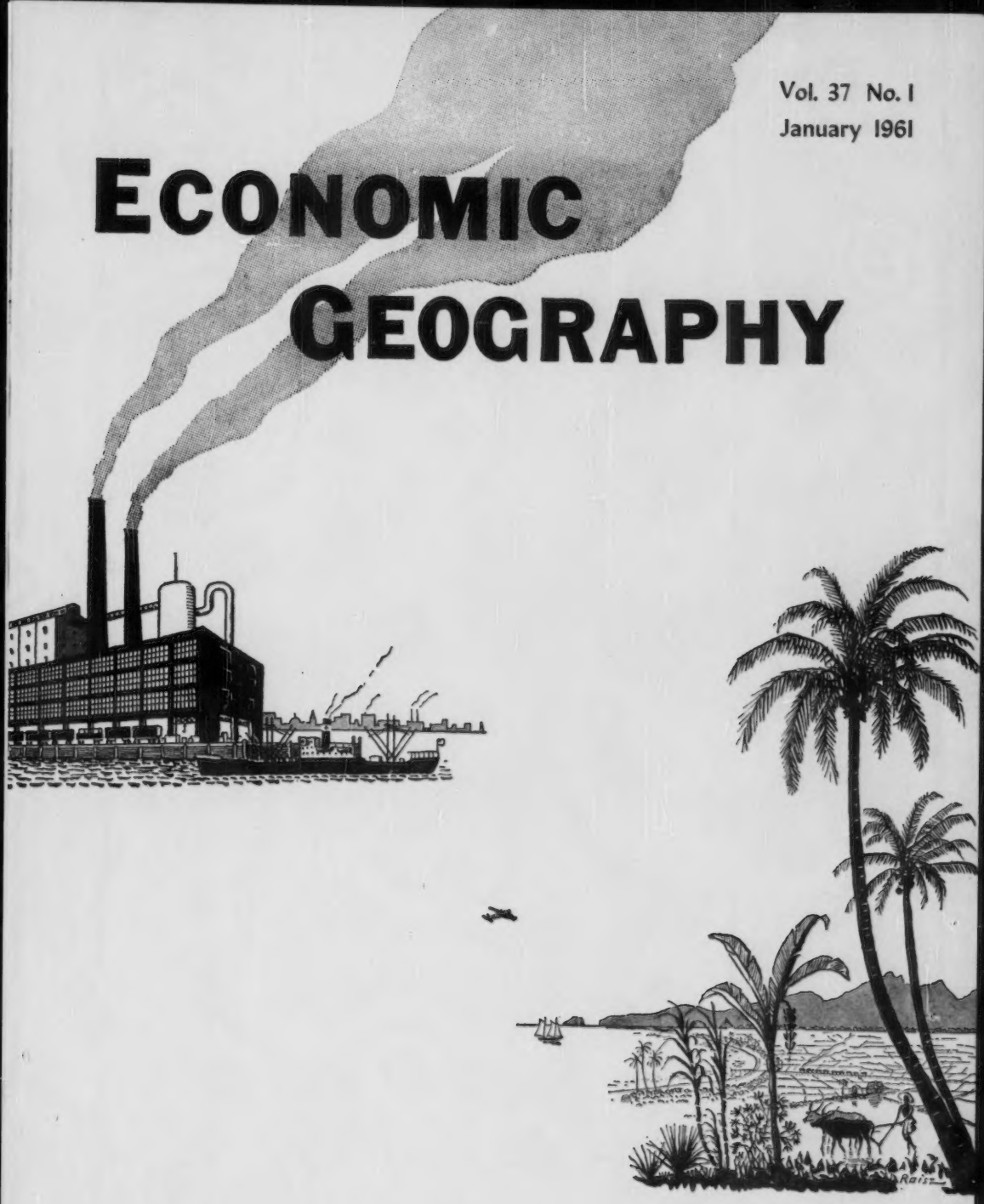
Vol. 37 No. 1
January 1961

ECONOMIC GEOGRAPHY



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This magazine publishes articles in the field of economic geography as well as articles in adjacent fields that contribute to an understanding of the world's economic patterns.

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The editors and the University assume no responsibility for statements and opinions expressed by contributors

ECONOMIC GEOGRAPHY

Editorial and Business Offices: 950 Main Street, Worcester, Mass.

Published Quarterly at
Commonwealth Press, 44 Portland Street, Worcester, Mass.

PRICE, $2.00 THE CURRENT NUMBER SEVEN DOLLARS A YEAR (except for charter subscribers)

Second Class Postage Paid at Worcester, Mass.

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MARKETING GEOGRAPHY COMES OF AGE

Several decades ago it was realized that economic geography could no longer be regarded as a research specialty. The economic geographer who claimed any degree of penetration in his research had begun to think of himself as working in land utilization, in manufacturing geography, in the geography of transportation, or in some other special field, and made no pretense to competence in research in economic geography as a whole. This situation was recognized in the early 1950's when *American Geography: Inventory and Prospect* was being prepared.

It is interesting to note, however, that in the family of economic geography fields as treated in the book, marketing geography received only limited recognition. It was not considered to have reached full status but there were signs that it was fast approaching that level. Academic geographers who, a decade or two earlier, would have shuddered at the idea of the practical application of their field had begun to look to marketing geography as a direction in which geography had a good chance of expansion. Here was a new avenue of employment for graduates who previously had been restricted to teaching or government work. And here, too, was a basis on which geography could be ranked with fields that had real value beyond the walls of the classroom. Whereas, earlier, marketing geography had been a direction that was largely ignored, the element of applied research was giving the whole discipline increased stature.

In the last decade the practitioners of this adolescent field have grown in numbers and in activity. There could be no better evidence of this than the group of articles to which much of our January issue is devoted. They are based on papers that were presented at one of the special sessions of the Association of American Geographers meetings at Dallas, April 18 to 22, 1960. The editor welcomes this opportunity to give our readers a view of the varied interests in this new *field*, for now marketing geography surely has reached this level. No longer merely a promising junior member of the economic geography family, it appears to have come of age.

RAYMOND E. MURPHY

ECONOMIC GEOGRAPHY

VOL. 37 JANUARY, 1961 No. 1

LOCATION RESEARCH PROGRAMMING FOR VOLUNTARY FOOD CHAINS

Saul B. Cohen

Dr. Cohen is Associate Professor of Geography, Boston University, and a consultant in store location and development research.

FOOD retail outlets fall into three general categories: (1) corporate chains, (2) wholesaler-affiliated, either as voluntary groups or retailer cooperatives, (3) unaffiliated independents. The second category, the wholesaler-affiliated, is the second largest. Its stores account for 33 per cent of U. S. retail food store sales.[1] To compete effectively with corporate chains, the affiliated retailers seek from their wholesaler a wide variety of purchasing, warehousing, and store services.

This paper deals with location research for voluntary groups. While techniques and procedures do not essentially differ from those that have been evolved in chain store research, the uniqueness of the wholesaler-affiliated structure does call for differences in research emphasis and interpretation. Moreover, market characteristics and trading area features that reflect the uniqueness of voluntary groups have been uncovered in the course of this research.

Of the two wholesaler-affiliated types, the voluntary groups, often referred to as voluntary chains, appeared in the United States in the 1920's (Independent Grocers Association, Red and White, Clover Farm Stores, Nation Wide Stores, etc.). They have since become widespread in Canada and in Western Europe (Spar, Centra, VIVO).

Initiated by the wholesaler, the voluntary chain can be defined as "an association of wholesale and retail concerns which have, by general agreement, adopted a common and uniform plan for the rationalization of their entire business."[2]

Retailers bear a common name and a common sign, and usually carry a common brand label. There are no rigid contractual obligations between retailers. Those between retailer and wholesaler vary, but the trend in the United States and Canada is for increasingly rigid obligations and greater mutual responsibilities.

In recent years, voluntary chains have increased their numbers and sales rap-

[1] Staff Report to the Federal Trade Commission: *Economic Inquiry Into Food Marketing*; Part I, Concentration and Integration in Retailing, Washington, D. C., June, 1959.

[2] "How Can Voluntary Chains Operate Successfully," by K. Berendt, Reporter, in *4th International Congress on Food Distribution*, Commissions' Reports 1, Vol. I, Lausanne, June, 1959, pp. 143, 144.

idly.[3] To enlarge their retailer membership and to exercise greater controls over them, more aggressive wholesalers have become involved in retail store development. This has called for the assumption of primary leases by the wholesaler, with a sub-lease to the retailer. It has also called for a search for specific sites and for finding outside financial resources to build stores on these sites.[4]

In connection with retail store development, wholesalers have begun to show a concern with location research and analysis. This concern, however, is still quite limited. A recent survey indicated that less than 2 per cent of the wholesaler-affiliated groups offer store location analysis service to their retailers.[5] It is encouraging to note that several leading voluntary chains have established store location research programs, and that the major association of voluntary chains, the National-American Wholesale Grocers' Association, sponsored an intensive clinic on the topic in September, 1959.[6]

Location research within voluntary chains presents problems generally not encountered within corporate chains. These problems arise from: (1) loose wholesaler-retailer relations, (2) individuality of different retailers affiliated with the same wholesaler, (3) belatedness of voluntary chains in sponsoring large, modern supermarkets.

Wholesaler-Retailer Relations

Corporate chains can readily secure vital in-store data about trading areas and customer shopping habits. Their stores will perform in a highly consistent manner, making possible the use of controlled tests in prototype stores.

Retail members of the voluntary chains will not always cooperate wholeheartedly with wholesaler-sponsored research programs. Nor do all wholesalers feel sufficiently secure in their relations with retailers to demand high level accuracy in reporting data. Past records of store trading area features are usually lacking. Moreover, store operations may be so highly individualistic that it is more difficult to reduce data pooled from various stores to a common base.

Inter-store Relations

With respect to inter-store relations, we find that stores belonging to corporate chains are unique competitors to one another. A chain store's most severe competitor, by far, is its sister-store. Within the voluntary chains, stores belonging to the same group but separately-owned, tend to behave as normal competitors.

Insufficient Store Samplings

Finally, while national and regional chains have large numbers of supermarkets, most voluntary chains lack sufficient new stores to supply the researcher with a comparative data base. Where leading wholesalers have acquired a substantial number of supermarket members in the past two or three years, these tend to be concentrated in rural areas and isolated cities and towns. The voluntary chains generally lack adequate experience in the

[3] In 1958, 319 wholesalers served 34,809 affiliated retail stores. The estimated annual sales of these stores were $13 billion. Sales by the wholesalers, $3.95 billion, were 10.5 per cent higher than in 1957. Staff Report to the Federal Trade Commission, *Economic Inquiry Into Food Marketing, op. cit.*

[4] Twenty-nine per cent of the voluntary group wholesalers take prime leases and 61 per cent find the sites for new stores, according to a survey in *Facts in Grocery Distribution*, 1959 Edition, Progressive Grocer.

[5] William Applebaum: "New Horizons in Wholesaler-Retailer Field Supervision," Address to NAWGA Executive Conference, Bermuda, 1959.

[6] The NAWGA Clinic on Store Site Selection, held from August 24 to 28, 1959, in Portland, Maine, was directed by the author. Participants included several other geographers.

mass-markets of large, metropolitan areas.

A COOPERATIVE RESEARCH PROGRAM

It was in response to this last problem, in particular, that the author found it helpful to recommend to certain voluntary chains the establishment of a cooperative store location research program.

Participants to date are three groups in the New England region. Their effective operating territories include Maine, New Hampshire, Vermont, and North Central Massachusetts. Although most strongly represented in the rural areas and in isolated towns and cities, they have units in the smaller standard metropolitan areas and in towns on the fringes of Metropolitan Boston (Fig. 1).

The research program covers: (1) the study of existing stores as an empiric base for future studies. Of 260 stores affiliated with the three companies, 50 have been studied in depth. Of the remaining stores, some are being eliminated by the wholesaler because they are too small and their market potentials are limited. Still others are scheduled to be replaced with larger, modern units. (2) The preparation of master plans for store development for each company. (3) The assessment of store site proposals made by the company real estate departments.

MARKET AREAS AND SHARE OF THE MARKET

Voluntary and corporate chains differ from one another with respect to market characteristics and in-store trading area features. One such difference lies in the type of market area within which corporate chains and voluntaries operate (Fig. 2).

Headquarters cities have much to tell about the nature of the territory served. The largest corporate food chains in the United States (The Great Atlantic & Pacific Tea Co., Safeway Stores, Inc., The Kroger Co., American Stores, National Tea, Food Fair, Winn Dixie, Grand Union, First National Stores, Jewel Tea, Colonial Stores, and ACF-Wrigley) have their headquarters, respectively, in New York City, Oakland, Cincinnati, Philadelphia, Chicago, Philadelphia, Jacksonville, East Paterson, Boston, Chicago, Atlanta (East Point), and Detroit.

Leading voluntary chains (Super Valu Stores, Inc., The Fleming Co., Malone & Hyde, Groce-Reardon, West Coast Grocery Co., S. M. Flickinger Co., Stedman Co., Godfrey Co., The Creasey Co., Food Marketing Corp., Hannaford Bros. Co., Thomas & Howard Co.) have their headquarters, respectively, in Minneapolis, Minnesota; Topeka, Kansas; Memphis, Tennessee; Victoria, Texas; Tacoma, Washington; Buffalo, New York; Beaumont, Texas; Milwaukee, Wisconsin; Louisville, Kentucky; Ft. Wayne, Indiana; Portland, Maine; and Columbia, South Carolina.

Headquarters cities tend to reflect such elements as company origins, current corporate interests, and the location and nature of the territory served. The three leading corporate chains, The Great Atlantic & Pacific Tea Co., Safeway Stores, Inc., and The Kroger Co., are centered in large metropolitan areas, and have their greatest strength in the urbanized areas of the West, the Midwest, and the Northeast, respectively.

The average metropolitan area population for the corporate chain headquarters cited is 5 million. Only Jacksonville is under 500,000. The voluntaries, on the other hand, concentrate upon rural areas and isolated cities. Eleven of the 12 headquarters are located in small metropolitan areas, the average size of the group being 500,000. All

SUBJECT
VOLUNTARIES
THEORETICAL OPERATING BOUNDARY
EFFECTIVE OPERATING TERRITORY OF I
EFFECTIVE OPERATING TERRITORY OF II
EFFECTIVE OPERATING TERRITORY OF III
WAREHOUSE
NUMBERS IN CIRCLES INDICATE
METROPOLITAN POPULATIONS IN THOUSANDS
0 32 64
Scale in Miles
60
50
70
140
110
45
45
75
115
105
300
METROPOLITAN BOSTON
2700

FIG. 1.

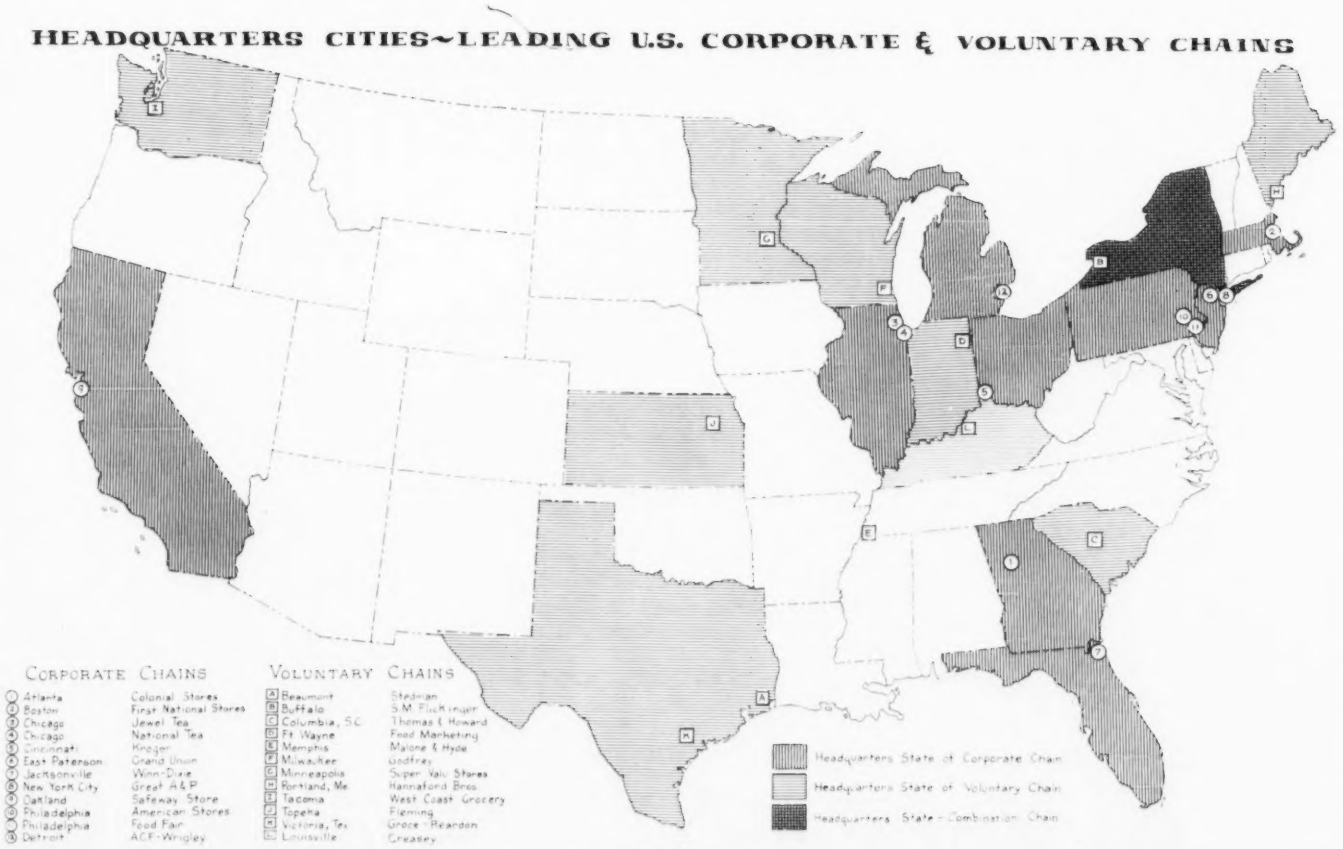
HEADQUARTERS CITIES~LEADING U.S. CORPORATE & VOLUNTARY CHAINS
CORPORATE CHAINS
Atlanta — Colonial Stores
Boston — First National Stores
Chicago — Jewel Tea
Chicago — National Tea
Cincinnati — Kroger
East Paterson — Grand Union
Jacksonville — Winn-Dixie
New York City — Great A&P
Oakland — Safeway Store
Philadelphia — American Stores
Philadelphia — Food Fair
Detroit — ACF-Wrigley
VOLUNTARY CHAINS
Beaumont — Stedman
Buffalo — S.M. Flickinger
Columbia, SC — Thomas & Howard
Ft. Wayne — Food Marketing
Memphis — Malone & Hyde
Milwaukee — Godfrey
Minneapolis — Super Valu Stores
Portland, Me — Hannaford Bros.
Tacoma — West Coast Grocery
Topeka — Fleming
Victoria, Tex — Grocer-Pearson
Louisville — Creasey
Headquarters State of Corporate Chain
Headquarters State of Voluntary Chain
Headquarters State - Combination Chain

FIG. 2.

told, six are under 300,000 in population.[7]

In terms of headquarter states, we find that average population density for the states within which the corporate chains are located is 170/sq. mile, and 67/sq. mile for the voluntaries. This includes an absolute increase of 26/sq. mile for the former and 7.5/sq. mile for the latter during the 1950–1958 period.

Within their effective operating territories, the large voluntary chains generally enjoy a higher share of the market than do competing corporate chains. While studies of corporate chains indicate shares of rural and small city markets that range up to 20 per cent (metropolitan area shares range from 10 to 15 per cent), studies of large voluntaries indicate ranges up to 25 per cent.

There are several reasons for the lead enjoyed by the voluntaries in their operating market areas: (1) The large corporate chains prefer to build in major metropolitan areas (one-third of all supermarkets in the United States are located in 29 counties); many corporate chains avoid areas which do not show at least a $1½ million annual potential for new stores. (2) Those voluntaries that are distant from the areas of strongest chain competition have been the most successful. These groups have remained fairly close to their original base of operations. Even the largest of the wholesale houses are usually family-controlled. Voluntary retailers usually have deep roots within their communities. As a result, voluntary chains have grown through more intense development of existing territory, rather than through territorial broadening (except in the case of mergers). (3) Voluntaries find it feasible to operate smaller volume supermarkets at a profit where corporate chains do not. This is related to differences in operating procedures, especially employment. Also, independent operators may have no alternative but to select lower volume potential supermarkets, because of capital limitations. The abilities of voluntary chains to operate small, as well as large stores, enables them to penetrate a market area more thoroughly.

STORE FRANCHISES AND TRADING AREAS

Most voluntary chains agree to space their stores so as to avoid direct competition between units. Leading spokesmen for the voluntaries have declared this as policy . . . "(Voluntary) retailers must not compete with each other, since that would prejudice not only favorable price-making but also the success of advertising."[8]

Some wholesalers use a formula based upon distance. A one-mile guarantee against additional store franchises is quite common. When a distance formula is utilized it is most feasible to weight it according to store location types. If the decision is made to space stores as to minimize the overlap of the major trading area (primary and secondary) of each store, then we must be mindful of the fact that the major trading areas of stores will vary in extent from ¾–1 to 3–5 miles, by location type. If the decision is to space stores so as to avoid primary trading area overlap only, then it must be kept in mind that the primary trading areas of stores will vary from ¼–½ to 1½–2 miles, by location type.

Results of studies undertaken show

[7] While retailer cooperatives are not treated in this study, it is significant that the majority of headquarters cities of leading retailer cooperatives are large cities. These include: Los Angeles, San Francisco, Chicago, Seattle, Denver, Grand Rapids, Michigan, St. Louis, Dallas, Elizabeth, New Jersey, Salt Lake City, Philadelphia, and St. Paul.

[8] "How Can Voluntary Chains Operate Successfully," *op. cit.*, p. 146.

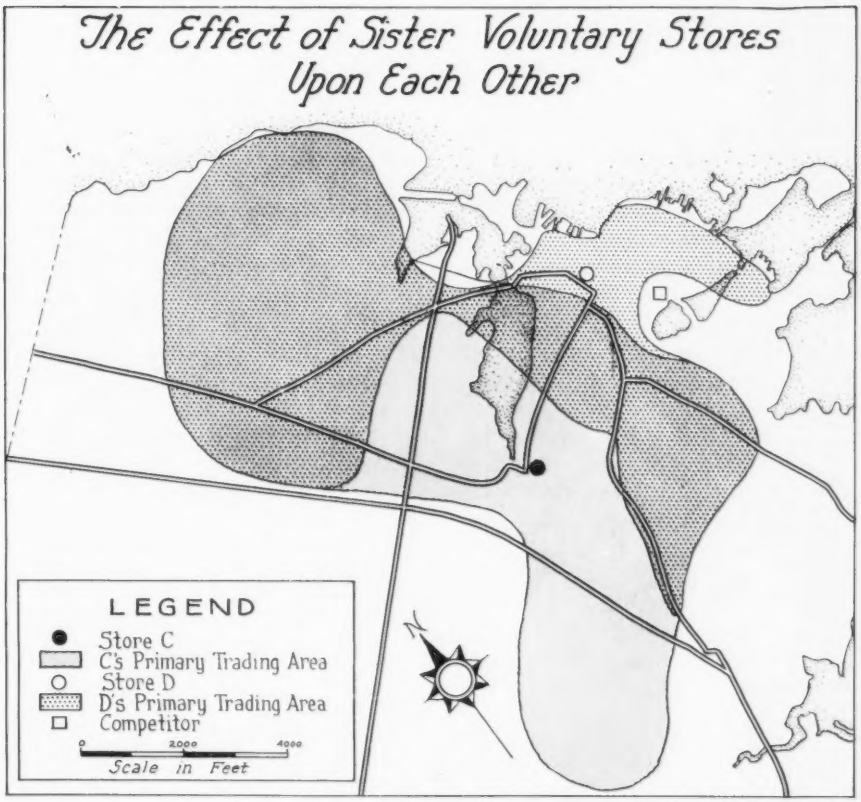

FIG. 3.

greater trading area overlap between neighboring sister-voluntary chain stores and consequently more extensive trading areas than for neighboring sister-corporate chain stores. The boundary between two corporate chain stores tends to be fairly sharp, and the overlap zone, narrow, because of the nearly identical personality of the stores (Fig. 3).

However, among the voluntaries, two separately owned units within the same group will reflect differences in management personality, practices, and operating standards. The impact of the location of one unit upon the other will therefore resemble the trading area impact patterns of normal competition (Fig. 4).

Because such stores do not abort each other's boundaries, as in the case for corporate chain units, they have relatively more extensive trading areas. Combined, they can hope to enjoy a higher share of the market than would chain supermarkets in comparable locations.

INTER-WHOLESALER BOUNDARIES

The three subject wholesalers operate within contiguous territories, whose population totals 4 million. However, the territory within which their affiliated

stores operate effectively includes only 3¼ million people (Fig. 1).

In the north, boundaries between wholesalers follow the eastern ranges of the White Mountains, and their foothills' lakes district. Absence of population along this boundary zone reduces the possibility of territorial encroachment by the wholesalers. Also, limited market potential reduces the number of stores along the boundary, whose store trading areas might overlap the boundary. To the wholesalers abutting this zone, it is a "waste frontier" in a market penetration sense because of its lack of people.

In the south, the boundary is drawn so as to include within one wholesaler's territory most of the densely populated zone of Southern New Hampshire and Northeastern Massachusetts. To date, this zone has not been effectively served by any of the wholesalers, both because of distance from the respective warehouses and because of the strength of corporate chains within the zone.

Indications are that this zone will not long remain a "waste frontier." Each wholesaler is now geared to enter selected portions of larger metropolitan areas. The master plans for each company point out the possible functions of forward points for retail store development or "wachstumspitzen." It may prove feasible to redraw territorial boundaries in the area so that each

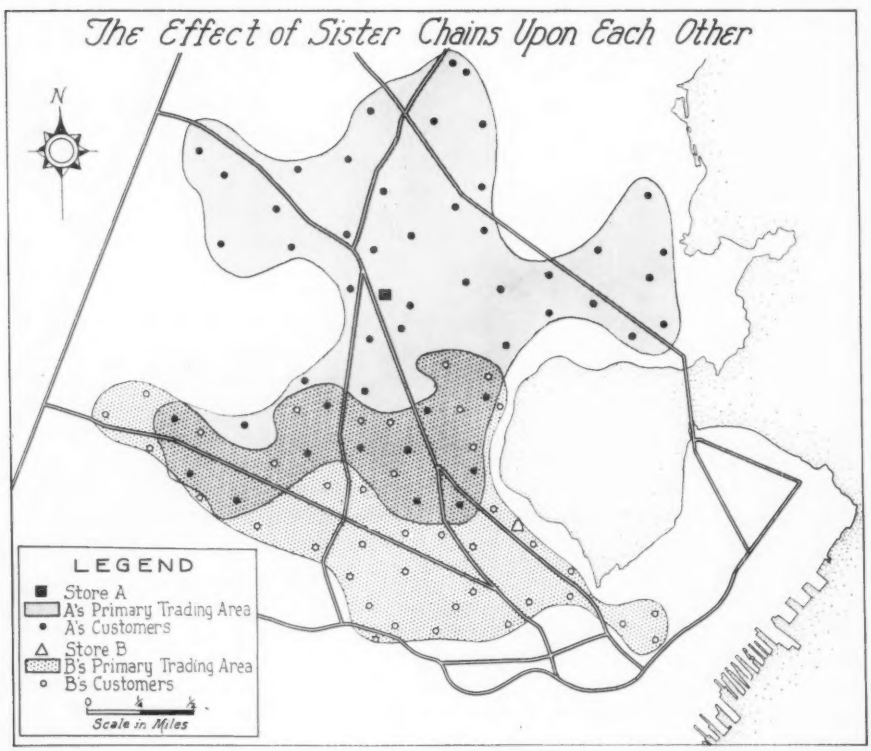

FIG. 4.

core will have a stronger outlying concentration of retail stores along its boundaries. Each company will then be better equipped to fill in the less populated intermediate portions of its territory with medium-sized units. Ironically, it is high population density and its attraction to competition that, in this instance, has discouraged retail store activities by the wholesalers. Thus, the zone represents a "waste frontier" between the wholesalers in a market penetration sense, because of its large number of people.

STORE OWNER CAPABILITIES

Voluntary chains have flexibility with respect to store locations that corporate chains do not have. They also have serious problems because of their commitments to affiliated members. The voluntary can—indeed it must—match trading area potential with store owner capabilities. A high-volume potential site, if developed for a retailer who is more suited to operating a small store, will not realize its potential and will invite financial failure. In store development programming, the wholesaler must be prepared to face up to the fact that the easiest course (i.e., the building of a large, new facility for an operator who has an outmoded unit) may be the most hazardous. On the other hand, many wholesalers are in a position to maintain contact with a variety of possible new store operators, such as: members who have successful supermarkets and are capable of becoming multiple-store operators; members who seem best suited for medium-sized supermarket or superette operations; chain store managers or in-company store supervisors who can become successful large store operators.

Some wholesalers maintain different types of store franchise organizations so that they can serve the large and small units simultaneously. This affords the wholesalers flexibility, enabling them to gear different site potentials to different store operator capabilities.

Although trading area overlap occurs, the competition between stores of different sizes and functions is not so acute as to eliminate the possibility of their belonging to the same voluntary group. An example of this is illustrated by the following map of the trading areas of three separately-owned sister stores belonging to the same voluntary chain (Fig. 5).

Two stores cater to customer convenience by evening and Sunday openings. Average annual sales of these stores is $\$^3_4$ million. The third, the largest of the area supermarkets, has sales amounting to $3 million. In this instance, the stores complement one another. Together with other voluntary members, they enable the subject voluntary chain to obtain 35 per cent of the entire market (with a total trading area population of 70,000).

THE EMPIRIC BASE

Much of store location research consists in gathering data on existing stores from which to build an empiric base for analysis, and from which to develop models for new store projections. Our studies indicate close correlation between voluntary group stores and corporate chain stores. It is the character of the particular voluntary group that is most important, not the fact that it is a voluntary group and not a corporate chain. Performances of different corporate chains are more widely varied than those between corporate chains and voluntaries as a whole.

What is to be noted among stores belonging to voluntary groups is the somewhat greater range between the extremes. The use of extremes as a

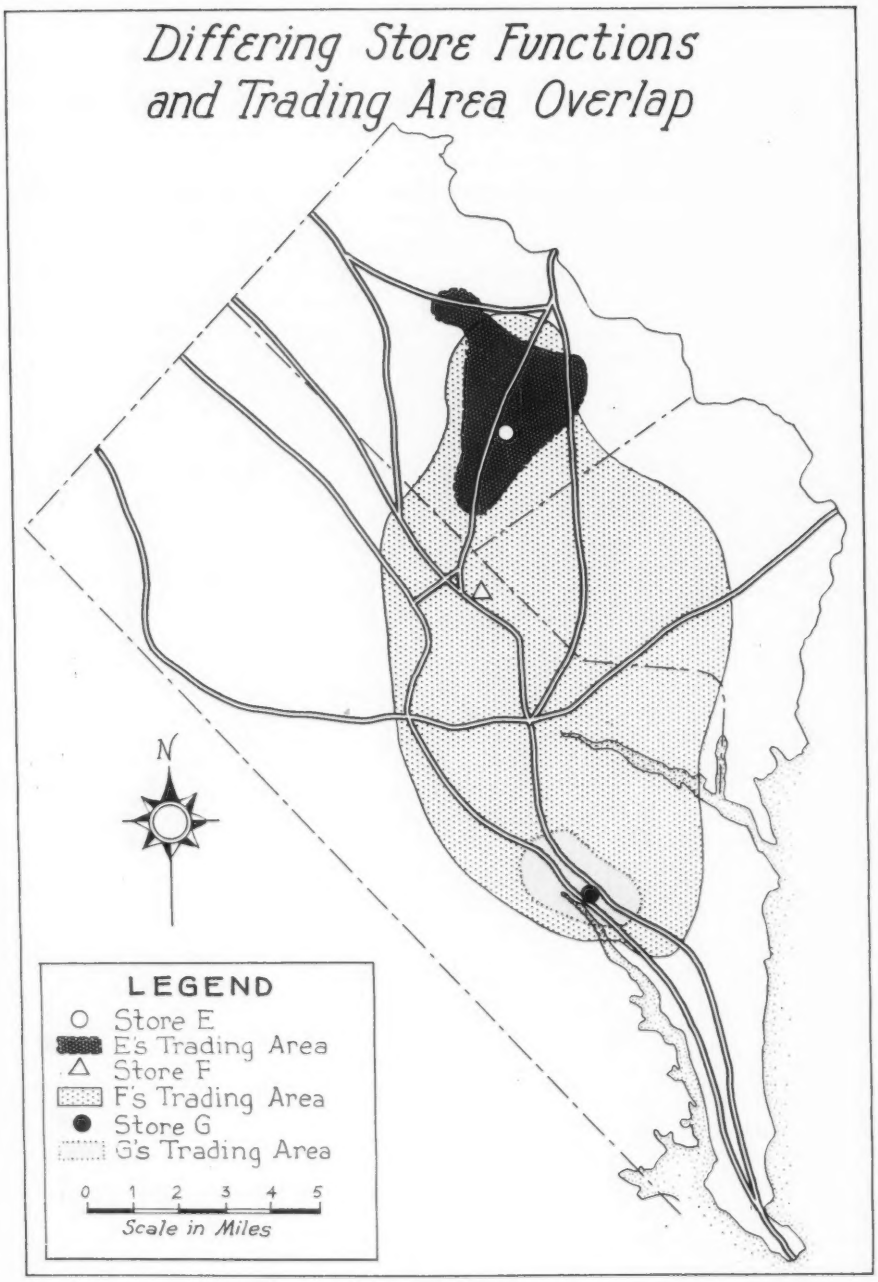
Differing Store Functions
and Trading Area Overlap
N
LEGEND
Store E
E's Trading Area
Store F
F's Trading Area
Store G
G's Trading Area
0 1 2 3 4 5
Scale in Miles

FIG. 5.

basis for projecting store volume potential, therefore, plays a vital role in research for voluntaries. As voluntary chains begin to behave increasingly like corporate chains in the development, supply, promotion, and supervision of retail stores, the range of store performance extremes narrows. The human element, however, plays a unique role within the present structure of this group. Consequently, the weighting of median data to anticipate variation in store operational procedures will continue to challenge the individual location researcher.

The research program that has been discussed is a venture in applied geography. It has been welcomed by its sponsors who are conscious of their need for location research and are aware of their inabilities to carry through such a program independently because of their limitations in size and experience. Through the mechanism of cooperative research, it is possible to serve the practical needs of companies that are representative of an important segment of the food industry. Gratifying to our interests as professional geographers has been our ability to find employment for graduate geographers; to guide the research along varied channels, sifting empiric evidence and testing hypotheses; and to broaden field work experiences.

EVALUATION OF AN ESTABLISHED PLANNED SHOPPING CENTER

Bart J. Epstein

Dr. Epstein is Manager, Property Acquisition, Stop & Shop, Inc., Boston.

BY mid-1960, there will be at least 4000 planned shopping centers of various sizes in operation in the United States; hundreds more are being built or proposed.[1] Daily decisions are being made regarding participation by retailers in these marketing complexes. Millions of dollars are being committed with only experience as a guide.

Experience has demonstrated that serious consideration must be given to location decisions regarding planned shopping centers. These decisions must be based not only on retailing experience, but also on market data, and store and shopping center characteristics.

Market data are available in varying degrees of quality and sophistication. Many retailing organizations have undertaken research programs to avail themselves of good specialized market data as well as detailed information on their own business and retail outlets.

Planned shopping centers are still a rather recent phenomenon. They have been studied from many points of view, and many articles have been written about them. Unfortunately, most of these published accounts are descriptive.[2] Consequently, a cooperative effort was launched to seek substantive data on shopping centers which could be reported and shared.[3]

Method

In 1940[4] and again in 1951,[5] a method was described for measurement of a trading area—the area from which a store obtains its customers. In conjunction with the trading area measurement it is possible to obtain other marketing data about a store and its customers. The basic technique developed by William Applebaum is the base for what has evolved as a methodology for shopping center study.[6]

What to Gather

In order to evaluate a planned shopping center, a basic question must be answered: what specific information must the researcher gather in order to determine the trading area and the supplementary marketing data? The most important and most reliable information is the customer's home address; this

[1] S. O. Kaylin: "Centers in High Gear," *Chain Store Age*, May, 1959.

[2] Saul B. Cohen: *Selected Annotated Bibliography on Shopping Centers*. (Cincinnati: The Kroger Co., January, 1957), pp. 1 f.

[3] This has been a joint venture between The Kroger Co. and Stop & Shop, Inc. The evaluation reported here does not include financial aspects of shopping centers (neither volume of sales nor real estate investment are considered).

[4] William Applebaum: "How to Measure the Value of a Trading Area," *Chain Store Age*, November, 1940, pp. 92–94, 111–114.

[5] William Applebaum and Richard F. Spears: "How to Measure a Trading Area," *Chain Store Age*, January, 1951, pp. 149–154.

[6] Recent contributions have been made by William Applebaum, Saul B. Cohen, Howard L. Green, Harris Lawless, Jack C. Ransome, and Frank J. Sparicio in cooperative research carried on by The Kroger Co. and Stop & Shop, Inc.

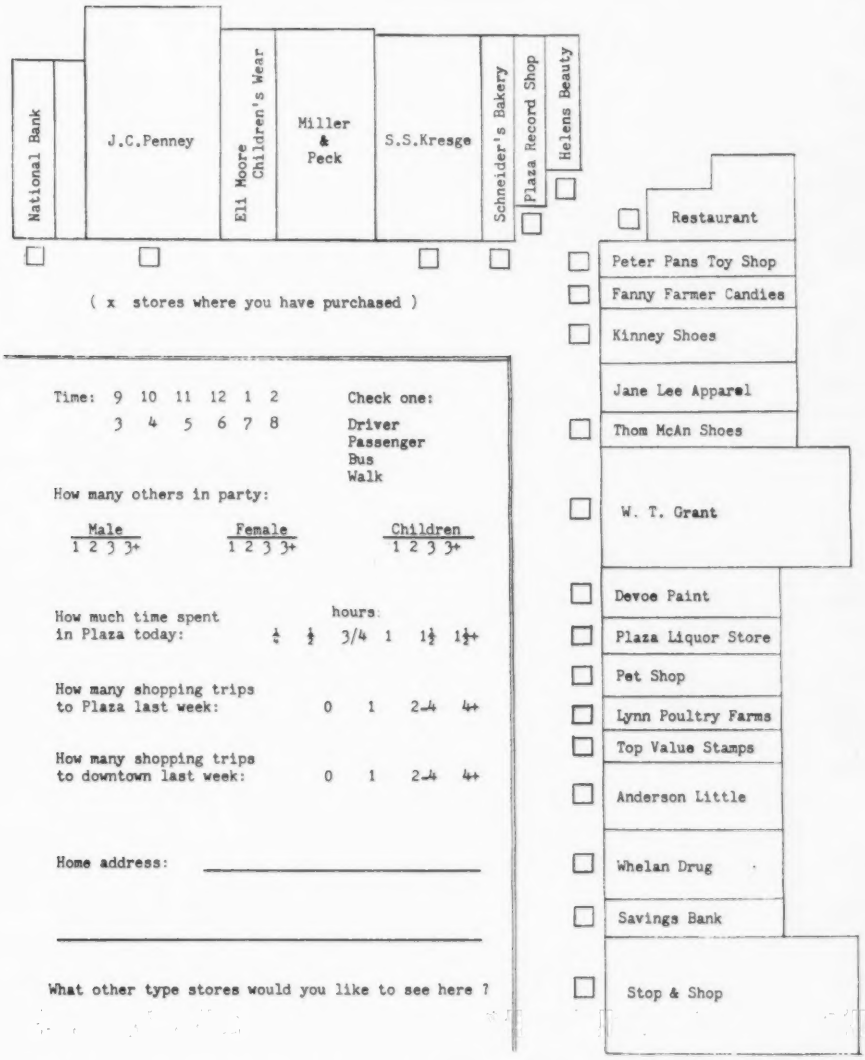

FIG. 1. Interview recording form devised for trading area analysis of Waterbury Plaza, Waterbury, Connecticut.

provides the key to trading area determination. Subsequently, tabulation of the store or stores in which purchases were made during the specific shopping trip provides the measure of individual store trading areas within the center as well as of cross-shopping among stores within the center. Further useful categories are the means by which the customers come to the center (although this is mostly by automobile), the frequency of shopping trips to the shopping center

and the "downtown" area (CBD), customer sex, and the date and time of interview.

FORM DESIGN

All of these data can be obtained best by interview, which necessitates design of recording forms. The form that has been adopted is 7″ x 8.5″ and top-bound in cardboard-backed pads of 60–100 sheets. It is easy to handle both in the field and in the office. After a series of experiments, the form shown as Figure 1 has proved most useful in insuring maximum accuracy from both interviewers and respondents. The sketch of the shopping center with all stores identified by name and position facilitates recording for the interviewers, and refreshes the memory of the respondents. Simple pencil marks on the form complete the answers to all questions except the home address.

It should be recognized that these data have varying degrees of reliability. Information gathered by observation such as date, time, and sex are most reliable. So long as the recording of the customer's address is done legibly and accurately, it too is very reliable. All other information is based on recall and is therefore subject to question in an evaluation of data.

INTERVIEWING

Common walls and parking lot make a physical unit of a planned shopping center. The parking lot is the most practical place to conduct customer interviews. Most planned shopping centers are set back from the street so that customers who walk or cycle, or use public transportation can also be easily interviewed. The interviewer or interviewers (depending on the size of the center and the layout of its parking lot) work at random locations within the parking lot.

Interviewing is carried on during all hours and on all days that the shopping center or any of its major units are open for business. Customers are interviewed in the parking lot at the conclusion (or apparent conclusion) of the shopping trip. Since people are on their way out, the interview must be handled with tact and dispatch. In most cases, the approach, the questions, and the recording of data can be accomplished in under one minute per interview. The order in which the questions are listed and are asked is designed to save time and also to insure adequate opportunity for obtaining the respondent's home address (the item of information on which the greatest resistance, if any, is encountered).

Although women are often called on for interview work and have proven very pleasant and reliable, male interviewers are preferable for planned shopping center work. It is easier to call on men to work outdoors regardless of weather. Further, many states have labor laws governing hours of work for females, which could force the hiring of more interviewers than necessary.

SUBSIDIARY DATA

Before, during, and after the actual interviewing takes place, additional basic information is gathered. Up-to-date population data regarding numbers, distribution, and density are most important. These are supplemented by information on income and ethnic identities. Further, field trips and interviews with traffic authorities permit identification and classification of main and secondary roads. Finally, the commercial structure of the area is examined; and competitive shopping areas are located; and if the analyst is concerned with a specific type of business, then the main competitive stores are located and examined.

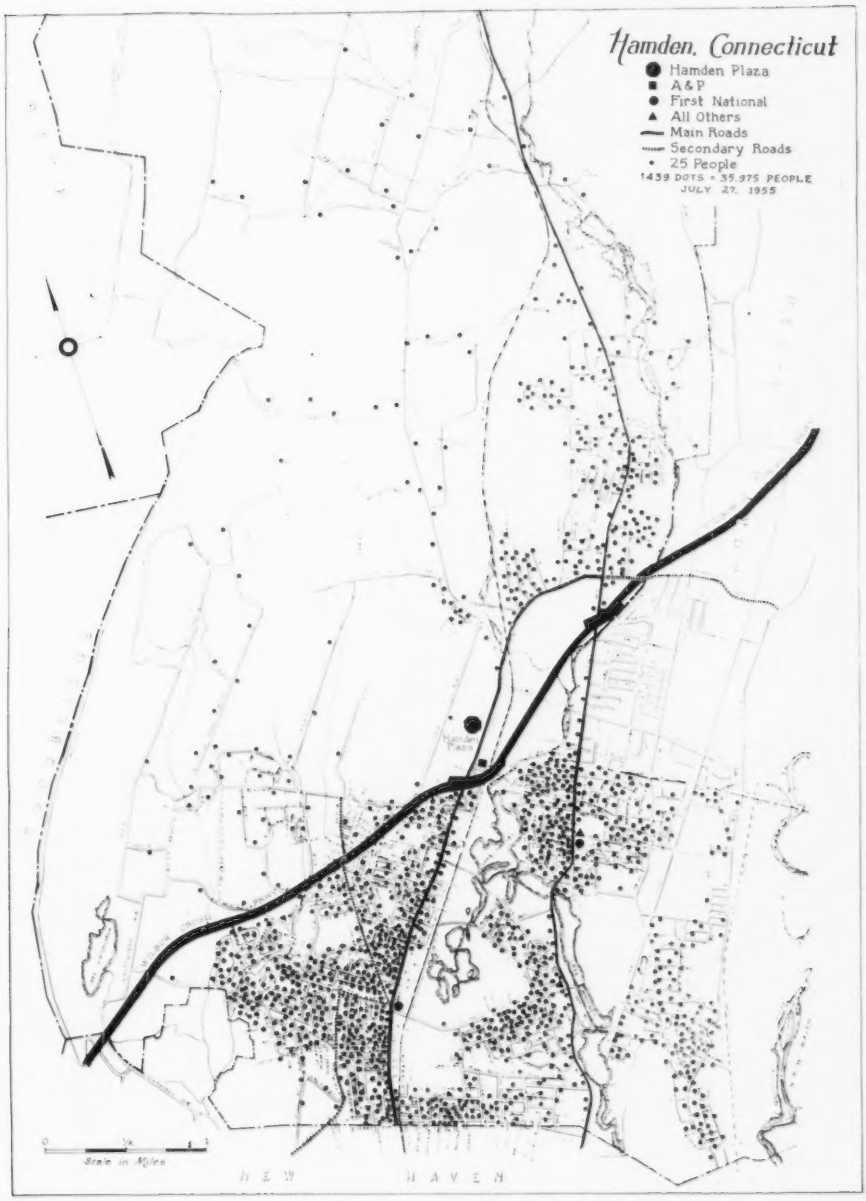

FIG. 2. Marketing map for Hamden, Connecticut, showing population, roads, and competition.

These basic data are then catalogued and a market base map is prepared. If a metropolitan map is available at a large scale, it is preferable to a series of individual city maps at varying scales. Unfortunately, these metropolitan maps

are not often available, and one often must utilize a series of separate maps—one for each major community (Fig. 2).

After the interviewing is completed, the forms are first arranged into separate groups by day of the week and by town or city; and then are arranged alphabetically by street and number within each municipal group. This facilitates map plotting of data, which is done with the aid of a city directory or similar street guide.

Before any entries are made on the base maps, the shopping center is located and a series of concentric zones are marked: ¼ mile intervals to 1 mile; ½ mile intervals to 3 miles; 1 mile intervals out to 5 miles.

Since there are so many retail units in a shopping center, only the major tenants are identified on the map and subsequently analyzed on a separate basis. Ordinarily, the symbols used by Applebaum and Spears[7] are adequate to account for customers of a single store. Plotting data for more than one store on one map, taking into account that a single shopper may patronize more than one store on a shopping trip, presents a cartographic problem.

Not until all of the plotting had been done, using a color code (which proved to be very difficult to read), was a system devised (by Professors Saul B. Cohen and Franklin C. Erickson of Boston University) which facilitated the drafting of a single map showing the trading area for the center and its major units for the week as a whole (Fig. 3). This master map is a tracing of the daily trading area maps accomplished by sequent addition of all data onto one sheet (Fig. 4).

[7] *Ibid.*

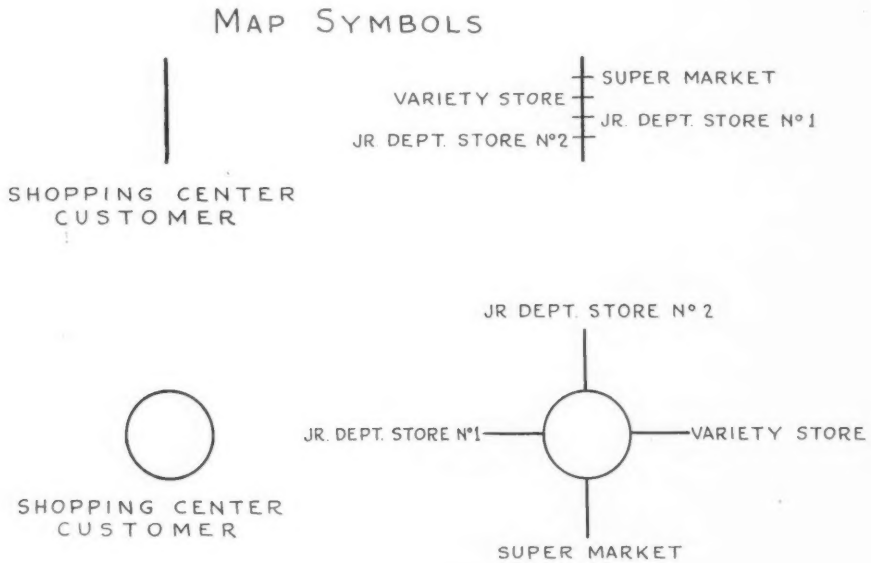

FIG. 3. Map symbols. A color code was used on the upper symbol: red for the supermarket, orange for the variety store, green for junior department store No. 1, and blue for junior department store No. 2. These colors resulted in a maze which could not be reproduced in black and white, and which created a mass of symbols which were difficult to read, resulting in the final adoption of the lower set of symbols.

Completion of the map plotting for each day of interviewing gives rise to raw data on the trading area of the shopping center and each of its major tenants. The interview forms are then arranged by municipality and by zone. This arrangement is the base on which all other counts and analyses are made.

At this point in the evaluation of Hamden Plaza the data were not placed on punched cards for IBM analysis. When more similar data for more shopping centers are available perhaps machine manipulation of data may prove economical and useful, and produce significant results.

ANALYSIS AND INTERPRETATION

Hamden Plaza is located on Connecticut Route 10, a north-south road, just north of the interchange with the Wilbur Cross Parkway, an east-west express road, approximately four air miles from downtown New Haven. At the time of this study, Hamden Plaza was the only planned shopping center of 100,000 square feet or more in the whole New Haven Standard Metropolitan Area.[8]

The creation of this shopping center—with about 300,000 square feet of floor area and parking facilities for over 2000 cars, in combination with an already existing very large Sears Roebuck unit across the street—created a major impact on the New Haven market (Figs. 5 and 6). Although the center as a whole draws 38 per cent of its business from Hamden (population 36,000) it also draws 18 per cent from New Haven (population 165,000) which is located at least two miles distant, 11 per cent from neighboring North Haven (population 12,000), and 35 per cent from towns more than five miles distant (especially from East Haven and West Haven). Half of Hamden Plaza's business originates within three to four miles and 65 per cent of its business comes from within a five mile radius encompassing about 200,000 persons (Fig. 7).

Despite the fact that Hamden Plaza has two junior department stores and a variety store in addition to a supermarket,[9] the supermarket had almost as many customer visits as the other three major tenants combined. In addition, the supermarket accounted for twice as many customers as its next most powerful retail partner at the center.

Since 54 per cent of the customers at this center shopped at the supermarket, it is to be expected that the trading area of the shopping center and that of the supermarket would be very similar. If this is demonstrated to be true in centers of similar size in other locations, it may lead to a short-cut method of trading area analysis.[10]

Further study of trading area data indicates that the junior department stores and the variety store are less dependent on close-in business and extend the trading area of the center to farther limits than the supermarket. Forty-four to 53 per cent of these customers come from areas greater distant than five miles.

CROSS SHOPPING

The number of customers making exclusive trips to each of the major tenants as well as the cross-trips among the stores' customers points to the dominance of the supermarket. Thirty-eight per cent of the center's customers shopped at only one major store, 25

[8] The New Haven Standard Metropolitan Area consisted of: New Haven city, East Haven, North Haven, West Haven, Branford, Hamden, Orange, and Woodbridge towns.

[9] One supermarket was operating at the time of the study. A second supermarket opened subsequent to the interviews.

[10] The Applebaum and Spears technique is easy to implement, and it has been further simplified at Stop & Shop, Inc.

FIG. 4. Trading area map of Hamden Plaza showing customers for Hamden only.

FIG. 5. Aerial view of Hamden Plaza. (Photo from *The Hamden Chronicle.*)

per cent of the total customers shopped at the supermarket exclusively, whereas only 4 per cent to 6 per cent of the center's customers shopped exclusively at the variety and junior department stores. Considering the center as a whole, 21 per cent of its customers shopped at two major tenants, 8 per cent at three majors, and 2 per cent at all major tenants (Fig. 8).

The dominance of the supermarket in the shopping center complex is re-emphasized in analyses of cross-shopping data by individual store. Forty-six per cent of the supermarket's customers shopped at the store only, and approximately 20 per cent of its customers shopped at each of the other major stores. Forty-five per cent of the customers shopping at the other major tenancies also patronized the supermarket (Fig. 8).

Junior department store No. 1 and the variety store had more exclusive visits than did junior department store No. 2; and each of them exhibited a greater exchange between themselves than either had with junior department store No. 2—although all of these units had an almost equal exchange with the supermarket.

This exchange of customers is carried over to other tenants in the shopping center. Further analysis of the remaining tenants whose trading areas were not differentiated on the maps indicated that the drugstore exerts the next greatest influence in numbers of customers as well as exchange among the major tenants. Its acceptance was almost as good

FIG. 6. Sears Roebuck store across Route 10—Dixwell Avenue—from the Hamden Plaza. (Photo from Sears Roebuck & Company.)

as that of junior department store No. 2. This exchange among tenants' customers is the strength of the shopping center—permitting it to draw and serve trade from great distances and also creating great loyalty.

The patrons of this center, who are dominantly female (2½:1), make five times as many trips to Hamden Plaza as they do to downtown New Haven. The sampling indicates almost two trips per week to Hamden Plaza per customer as opposed to only one visit per three customers to the CBD.

CONCLUSIONS

A well conceived and well arranged shopping center with adequate parking facilities can make a major trading impact on a metropolitan area. Hamden Plaza demonstrates its strength by drawing business away from the New Haven CBD. Its drawing power resembles that of the CBD of a medium-sized city.

The large number of customers attracted to the supermarket combined with the drawing power of the other major stores (variety and junior department stores) as well as the cross-shopping among them and the smaller stores enable all the stores in the center to compete on very favorable terms with their near-by competitors.

Although the shopping center as a unit may appear powerful and successful, these characteristics may not be evident in all stores. The supermarket and junior department store No. 2 were

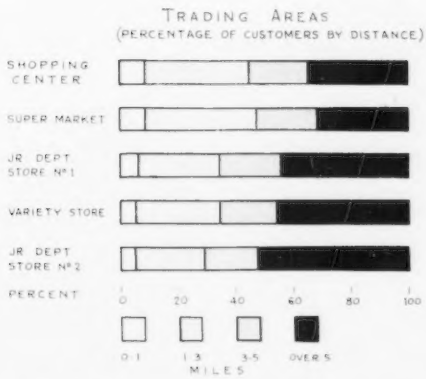

FIG. 7. Distances traveled by Hamden Plaza's customers.

both relative newcomers to this market. The supermarket had no difficulties in establishing itself, in spite of its competition across Route 10, but the junior department store was not readily accepted. This was not apparently due to location within the center, but more likely was because of duplication of merchandise lines with Sears Roebuck which was operating in a very large and very successful unit across the street. Time and merchandising can correct this situation.

The U-shaped shopping center laid out with wide parking aisles and generous parking stalls makes shopping pleasant for the female customer. Since she is so dominant in the mix of customers, the shopping center must appeal to her and cater to her desires and whims.

In summation, the Hamden Plaza retailing complex can serve as a model. Location on a wide, well paved road, with good cross access; attractive mixture of national chain and independent local merchants selling a wide variety of goods; well laid-out parking lot made convenient for female drivers; and absence of competition from other planned shopping centers within the trading area spelled success for Hamden Plaza. Success has, since, attracted competition. To the north a new planned shopping center is being developed, keyed to a supermarket, variety store, discount department store, drugstore, and other merchants who will complement and supplement what already exists in the area.

This study of Hamden Plaza supplied sufficient information on the market served by the shopping center to indicate that there was additional business that could be attracted to this particular shopping area to permit successful operation of two planned shopping centers. Thus, Hamden Mart, the new planned shopping center, should add new business to the area rather than merely split what is already there.

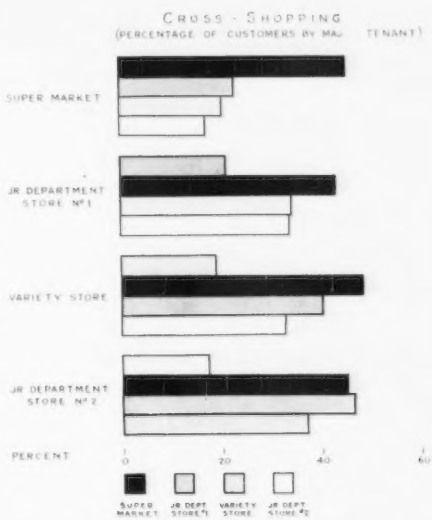

FIG. 8. Cross-shopping, Hamden Plaza.

PLANNING A NATIONAL RETAIL GROWTH PROGRAM

Howard L. Green

Dr. Green is Manager, Store Research and Development Department, Montgomery Ward, Chicago.

IN 1955, following a change in management policy and philosophy, Montgomery Ward resumed its retailing facilities expansion. This decision was a sharp departure from its policy of no expansion, replacement, or refurbishing of its existing stores that had been adopted in the period following World War II. This paper will discuss: (1) how Wards organized to handle this expansion, (2) what some of the initial problems were, (3) how a typical survey is conducted, and (4) the part geographers play in this program.

Wards' Retailing History

As early as 1921, Wards recognized that its direct mail order market was undergoing change. Farm population, the mail order backbone at that time, was slowing in its growth in the western states and decreasing the sales in eastern states. The solution suggested to this problem of a declining market was to open retail stores in urban places. Retail expansion began in 1926, with a big push in 1928 and 1929 when 495 stores were opened. Because these stores were designed as facilities where farmer mail order customers could see the merchandise, they were located mostly in smaller urban centers serving surrounding agricultural trading areas or towns geared to natural resource extraction (such as mining or lumbering).

During the depression, expansion ceased and 102 units were closed in four years. Expansion resumed in the mid-1930's with 175 stores opened from 1935 to 1941. The stores were still primarily in smaller markets, with Wards' first venture into a coordinated multi-store metropolitan program undertaken in Detroit just prior to World War II.

Organization of Research and Development

Resumption of Wards' growth in 1955 raised a series of basic market problems for the management, but most important was the question of how Wards should organize to carry out an orderly program of store development. A Store Research and Development Department was established in December, 1957. Its responsibilities included the following:

1. Study customer and consumer shopping habits and desires to determine the nature of the market for Wards merchandise.
2. Recommend specific markets to be surveyed.
3. Initiate and carry out the analysis of markets.
4. Recommend locations for new stores including the store size and store sales and profit forecasts.
5. Evaluate and recommend specific proposals for existing stores, including relocation, remodeling, or closing of units.
6. Recommend and direct the services of outside marketing counsel for advice and special studies.
7. Recommend the store development plan and program including esti-

mates of capital costs, sales, and profits within the framework of the long-term corporate objectives.

The composition of the Department at the present time includes four geographers (with additional background in retailing, market research, city planning, and cartography) and seven analysts with training in retailing, marketing, economic research, and business finance.

THE TOTAL WARDS' MARKET

The first problem approached, following the formation of the Department, was to define the existing and potential national market for Wards-Type-Merchandise (the kinds of merchandise the consumer could buy in a Wards store) in terms of the distribution of people, their purchasing power, and resulting retail sales.

Because of large financial commitments for land and building by the landlord and his long-term mortgages, new retail department store buildings are leased for 20 years, for as much as 30 years in a few cases. The lessee, therefore, in committing to these lengthy terms assumes the potential exists for profitable retail operations at that site throughout the length of the lease.

To reduce the risk, it was necessary to resolve the questions of where potential sales exist today, and in what communities is sales volume most likely to be maintained throughout the length of the lease. This involved market examination by:

1. Region of the country.
2. Rural vs. urban.
3. Metropolitan vs. non-metropolitan.
4. Suburb vs. central city.
5. County.

Since demographers have published no long-term studies of national population growth by small areas, it was necessary for Wards to undertake original research in estimating county population and retail sales for 1975.

THE TEXAS MARKET

As a result of this analysis, a priority program for study was established. The State of Texas provides an excellent example of how this priority program operates.

Texas is in the process of transition from an agricultural and mineral based economy to a broader based metropolitan economy. Wards in Texas had previously located its stores to serve communities based on agricultural and mineral economies.

As a result of market surveys in Texas metropolitan communities, extensive commitments have been made within the last three years. Twelve new, large department stores have been planned in Texas as well as a new distribution center in Fort Worth to serve these stores. The total commitment for these new facilities will exceed $20,000,000. Three of these new stores are to be located in Dallas, three in Houston, two in Fort Worth, one in San Antonio; three others —in Abilene, Austin, and Tyler—are to replace obsolete units.

Individual market analyses were made in each of these areas. The analysis techniques are a modification for the general merchandise field of those pioneered by William Applebaum in the 1930's and 1940's.[1]

THE FORT WORTH CASE

A typical survey of the market was made for Fort Worth. Wards' history in Fort Worth began in the mid-1920's when it opened a retail store in its Mail

[1] For a recent description of this technique, see "Store Location Analysis," by B. J. Epstein and H. L. Green, in *Marketing Research in Action*, Studies in Business Policy, No. 84, National Industrial Conference Board, Inc., 1957.

Order House located one mile west of the Fort Worth central business district (Fig. 1). In the initial report, the sales and profit history of this store was outlined, followed by an analysis of its physical facilities, its operating and merchandising characteristics, and its share of the Fort Worth sales of Wards-Type-Merchandise.

The economy was next analyzed. Fort Worth is a trading and manufacturing center differing from Dallas, 30 miles east, in that Fort Worth has a greater portion of its workers in manufacturing and less in finance and services. Prior to World War II, meat packing was the major manufacturing activity. Since then, manufacturing has been dominated by the aircraft industry, which accounts for almost one-half of total manufacturing employment. The recent high rate of population increase is directly related to the growth of manufacturing and the same will be true of future population growth. Currently, there are sizable areas located between Fort Worth and Dallas being developed for industrial use.

In the past eight years, this metropolitan area has grown at twice the rate of all United States metropolitan areas. This rate will continue for about the next ten years; later, a slightly lower rate will become evident.

In order to understand market trends within this metropolitan area, each of six geographic segments was studied individually. These segments were delimited on the basis of natural and man-made barriers to access, such as rivers and railroad yards (Figs. 2 and 3).

It is estimated that population growth will be rather even between 1958 and 1975 in all segments, except for a decline in the central segment and a greater than average growth in the northeast and southeast segments in the direction of Dallas.

Both downtown and outlying competition were reviewed in detail in our report.

Twenty-two competitive stores were important for Wards consideration in the Fort Worth market. These units contained over 1,600,000 square feet of gross floor area and had parking for 8250 automobiles.

About 60 per cent of the existing department store gross footage is located in the downtown area. According to

TABLE I

POPULATION GROWTH OF TARRANT COUNTY, TEXAS

Year	*Population*	*% increase over previous decade*
1930	197,600	..
1940	225,500	14
1950	361,300	60
1960	600,000 est.	66
1970	880,000 est.	47
1980	1,063,000 est.	21

TABLE II

ESTIMATED POPULATION DISTRIBUTION, BY SEGMENT

Segment	*1958*		*1975*	
	Population	*% of total*	*Population*	*% of total*
Central	57,400	11	47,000	5
NE	80,100	15	190,000	17
SE	145,400	27	320,000	31
SW	112,400	21	226,000	21
W	75,900	14	160,000	14
NW	63,800	12	120,000	12
	535,000	100	1,063,000	100

TABLE III

COMPETITION

Segment	*No. of stores*	*Gross sq. ft.*	*Parking*
NE	1	30,000	690
SE	5	177,000	1,690
SW	3	95,000	1,240
W	4	262,000	3,430
NW	3	47,000	450
C.B.D.	6	1,028,000	750*
Total	22	1,639,000	8,250

*Privately owned.

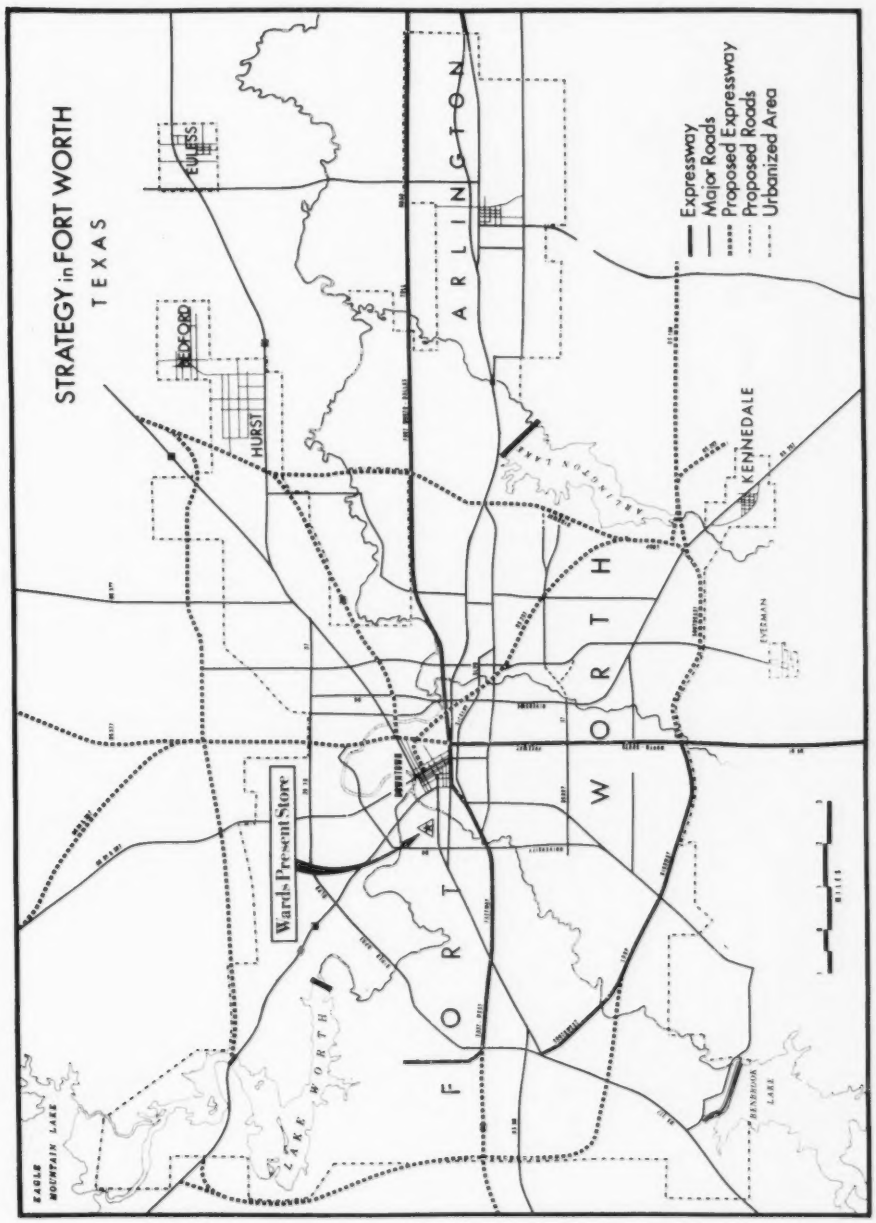
STRATEGY in FORT WORTH
TEXAS
Expressway
Major Roads
Proposed Expressway
Proposed Roads
Urbanized Area
Ward's Present Store
FORT WORTH
ARLINGTON
EULESS
BEDFORD
HURST
KENNEDALE
LAKE WORTH
EAGLE MOUNTAIN LAKE
BENBROOK LAKE

FIG. 1.

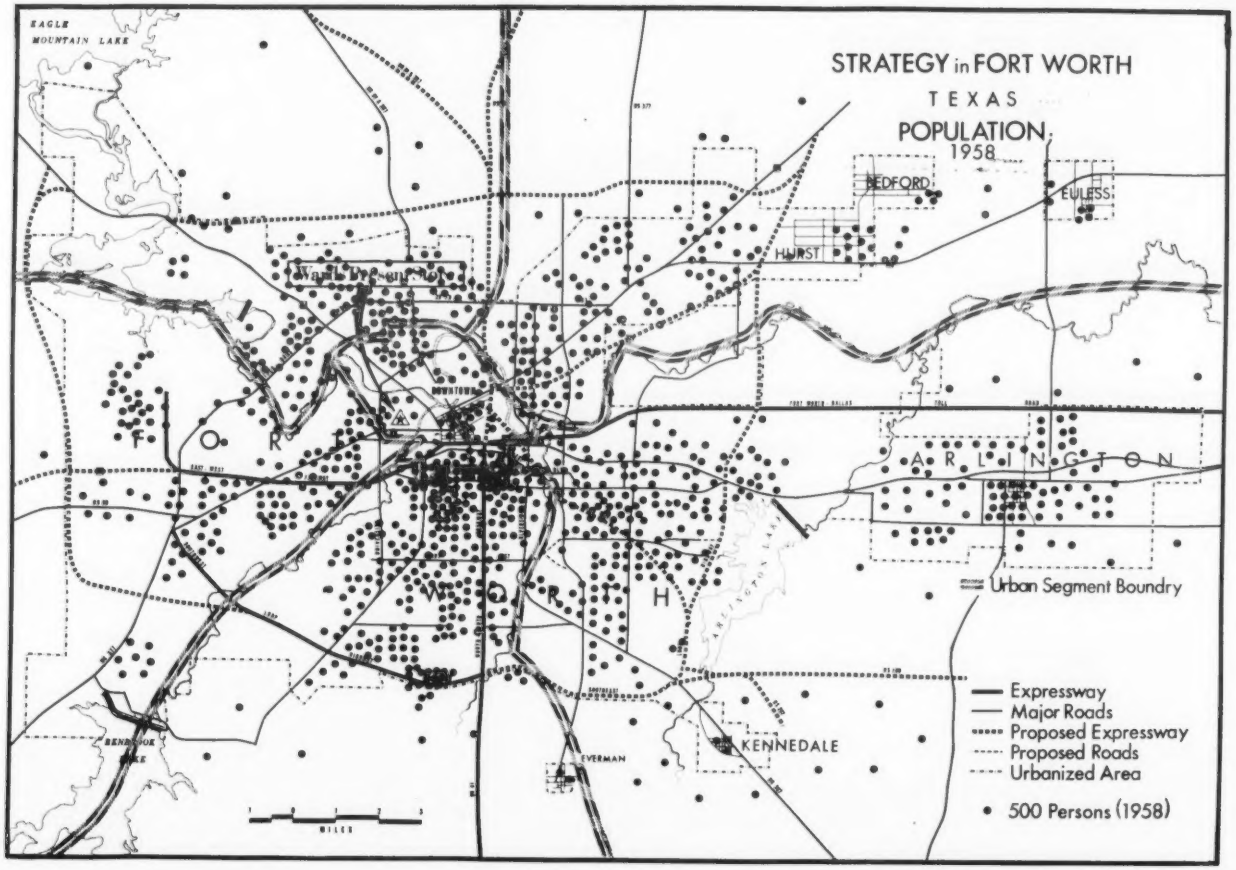
STRATEGY in FORT WORTH
TEXAS
POPULATION
1958
EAGLE MOUNTAIN LAKE
BEDFORD
EULESS
HURST
FORT WORTH
ARLINGTON
KENNEDALE
EVERMAN
Urban Segment Boundry
Expressway
Major Roads
Proposed Expressway
Proposed Roads
Urbanized Area
500 Persons (1958)

FIG. 2.

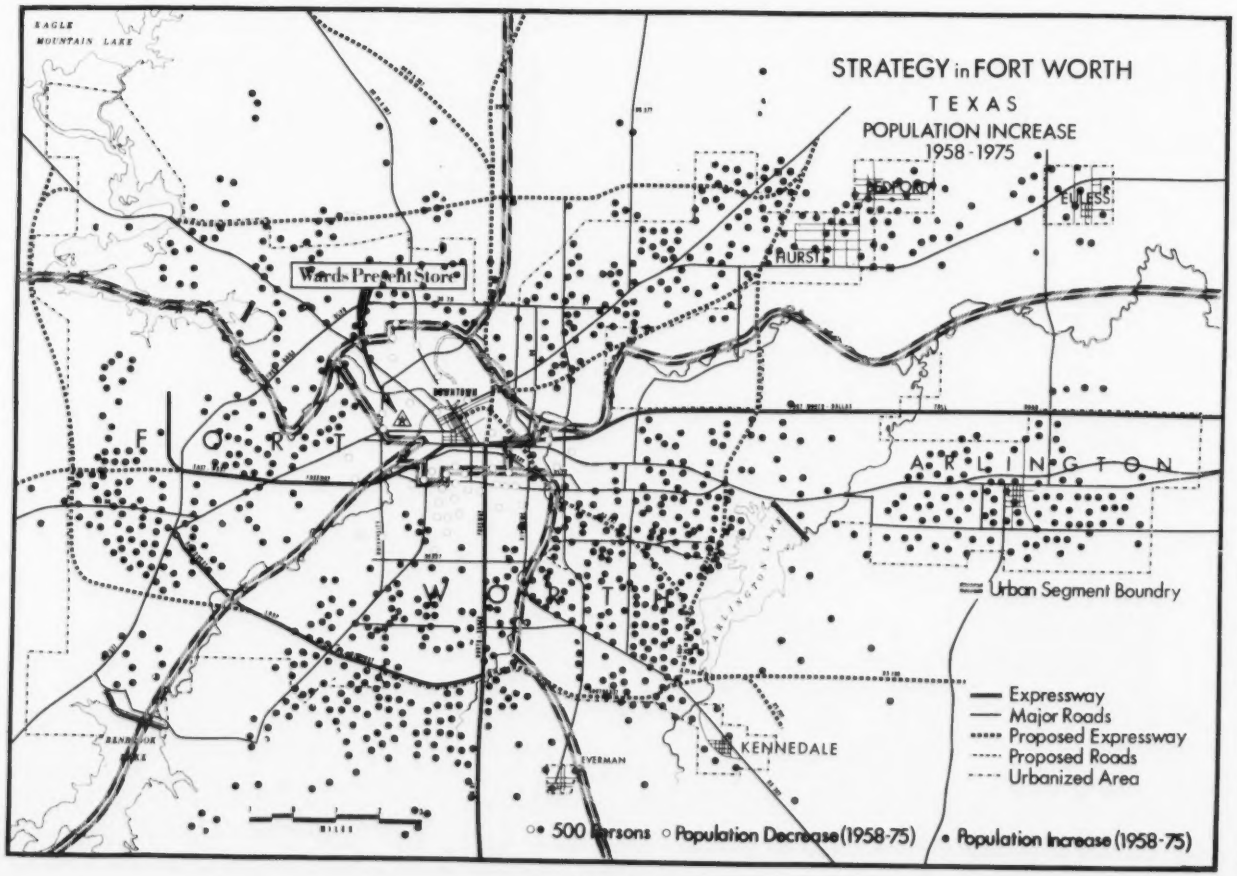
STRATEGY in FORT WORTH
TEXAS
POPULATION INCREASE
1958 - 1975
EAGLE MOUNTAIN LAKE
Wards Present Store
FORT WORTH
ARLINGTON
KENNEDALE
EVERMAN
BENBROOK LAKE
HURST
EULESS
Urban Segment Boundry
Expressway
Major Roads
Proposed Expressway
Proposed Roads
Urbanized Area
500 Persons
Population Decrease (1958-75)
Population Increase (1958-75)

FIG. 3.

local authorities, there is ample parking downtown for all but peak demand periods. However, the department stores are strung out for eight blocks, primarily along Throckmorton Street, and most lack adequate parking in their immediate vicinity.

The Gruen Plan for remodeling of the downtown area[2] has received considerable publicity. Primarily, it would eliminate downtown vehicular traffic and create a business district for pedestrians. However, even if the entire Gruen Plan became a reality, with the expected increase in population it would not obviate the need for outlying shopping centers.

Of the 16 outlying stores which bear upon Wards' strategy, ten carry primarily soft lines and only four carry hard lines. Except for free-standing Sears and Wards units, all are under 65,000 square feet and all located in shopping centers (Fig. 4).

Sears recently announced plans to develop a 220,000 square foot store in an 85 acre shopping center. It is to be located on the north-south expressway, five miles south of the existing Wards store (Fig. 4).

Current Wards acceptance in this market was then analyzed by a study of the trade areas of the existing store and also its share of the market in various parts of the trading area (Fig. 5). The trading area map—somewhat fictionalized in this example—indicates isopleths of average annual per capita sales for the population, using the technique of Applebaum and Spears.[3] The results are extremely valuable in interpreting consumer acceptance and the influence of barriers to trade. One notes, for example, the complete "shadow effect" of the downtown area in blocking from Wards the consumers who must first travel through the downtown area before reaching the store.

The next step taken was to evaluate a number of strategies for Wards in the Fort Worth market, recommending one. This proposal not only should increase Wards' sales, but also insure its continued leadership in Fort Worth. The strategy calls for a new full-line department store in the rapidly growing southeast segment and new full-line unit in the northeast segment of Fort Worth (Fig. 6).

Specific sites to carry out this strategy were next reviewed:

> The Ward Plaza site offers the best single opportunity for Wards in the southeast. It (a) penetrates the area to the east of the site just as well as if it was located farther east, because Lake Arlington cuts off this area on the east; (b) provides coverage for the market to its west and north which it could not otherwise cover if it were located farther east; and (c) retains penetration of the growing market to the south, much of which would be lost if located farther north or northeast.
>
> The site is located at the intersection of two four-lane streets, Berry and Riverside, five miles southeast of the existing store. It is centered in what is and what will continue to be the largest concentration of population in the Fort Worth area. The nearest competition will be Sears, two miles southwest.

Richland Plaza, in the northeast, located at the intersection of Highways 183 and 121, about eight miles northeast of the existing Wards store, appears to be the most suitable location in this segment. This shopping

[2] "A Greater Fort Worth Tomorrow," Greater Fort Worth Planning Committee and Victor Gruen and Associates, Inc., 1956.

[3] William Applebaum and Richard F. Spears: "How to Measure a Trading Area," *Chain Store Age*, January, 1951, pp. 149–154.

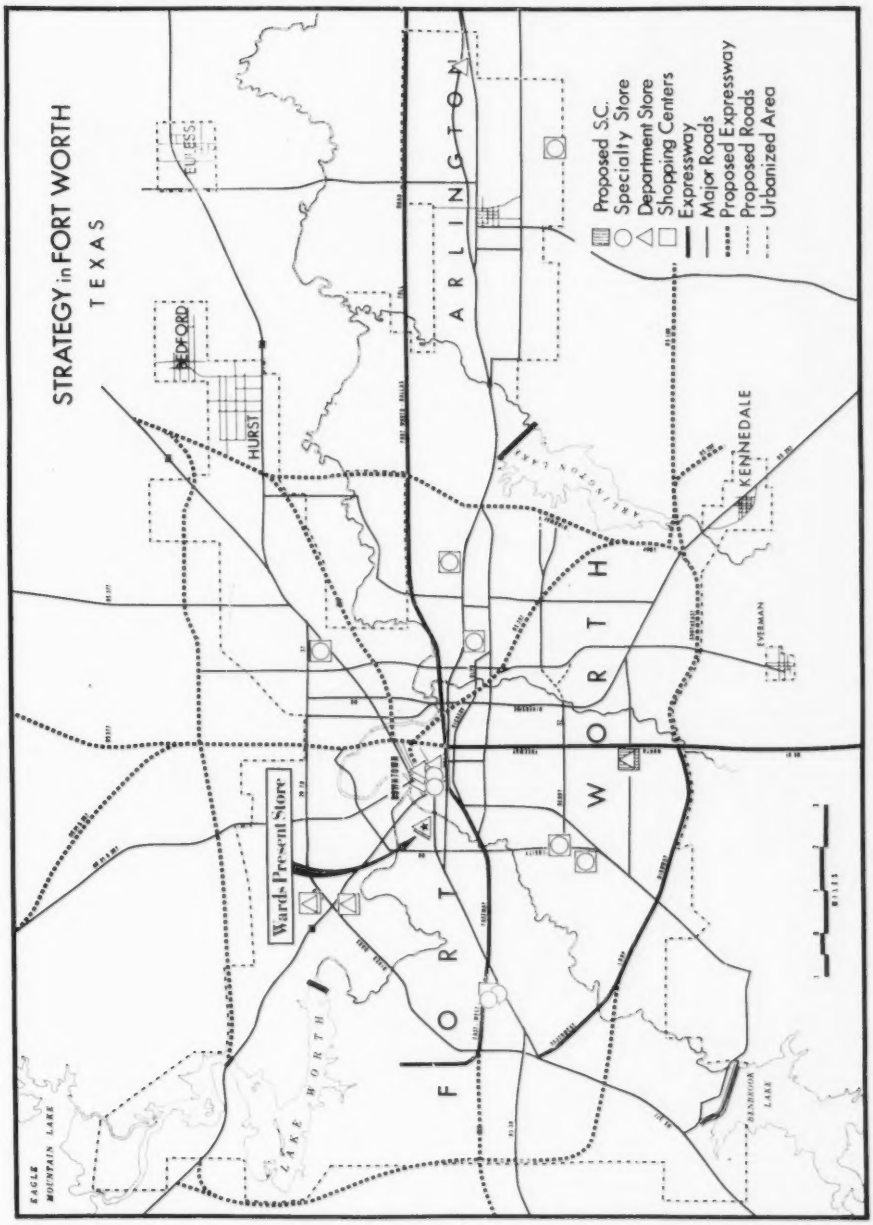
STRATEGY in FORT WORTH
TEXAS
Proposed S.C.
Specialty Store
Department Store
Shopping Centers
Expressway
Major Roads
Proposed Expressway
Proposed Roads
Urbanized Area
Ward's Present Store
FORT WORTH
ARLINGTON
BEDFORD
HURST
EULESS
KENNEDALE
EVERMAN
LAKE WORTH
EAGLE MOUNTAIN LAKE

FIG. 4.

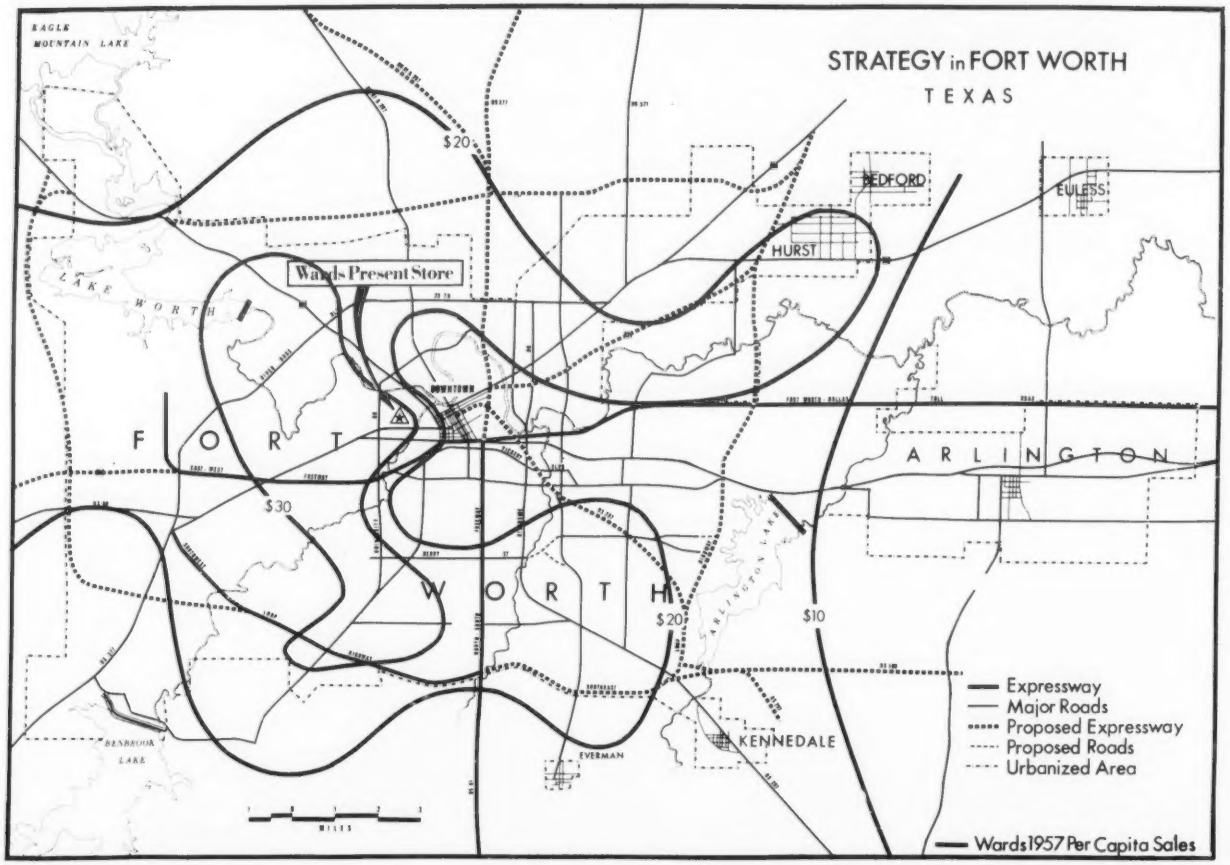
STRATEGY in FORT WORTH
TEXAS
EAGLE MOUNTAIN LAKE
LAKE WORTH
Wards Present Store
DOWNTOWN
FORT WORTH
ARLINGTON
BEDFORD
EULESS
HURST
$20
$30
$20
$10
ARLINGTON LAKE
BENBROOK LAKE
EVERMAN
KENNEDALE
MILES
Expressway
Major Roads
Proposed Expressway
Proposed Roads
Urbanized Area
Wards 1957 Per Capita Sales

FIG. 5.

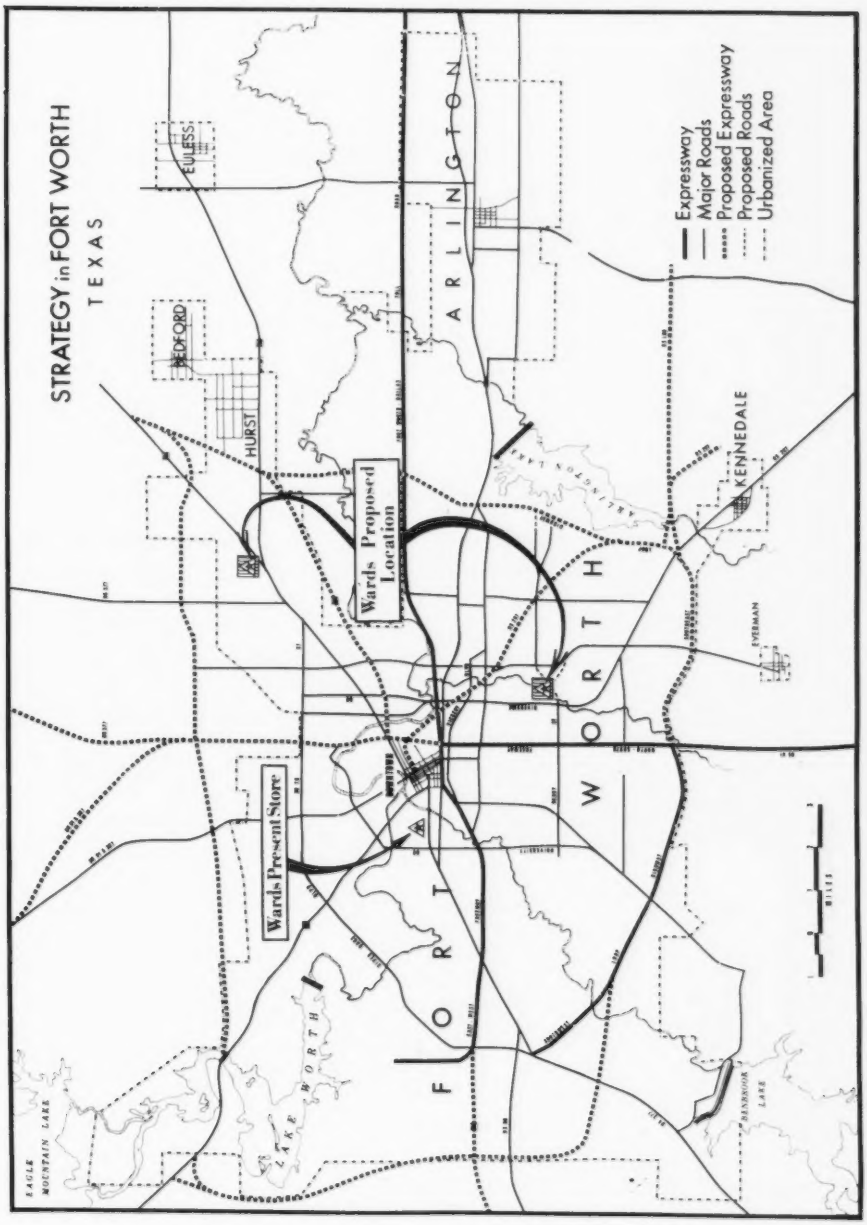
STRATEGY in FORT WORTH
TEXAS
Expressway
Major Roads
Proposed Expressway
Proposed Roads
Urbanized Area
Wards Present Store
Wards Proposed Location
FORT WORTH
ARLINGTON
EULESS
BEDFORD
HURST
KENNEDALE
EVERMAN
LAKE WORTH
EAGLE MOUNTAIN LAKE
BENBROOK LAKE

FIG. 6.

center has the advantage of being in a good position to tap both a sizable part of the existing northeast market and the anticipated growth of 110,000 people by 1975. The shopping center is located at one of the major intersections of the northeast segment.

For these sites, sales forecasts were developed by the Per Capita Sales method:

1. Average annual per capita sales penetration of the existing Ward store in this market was determined for each of some 50 census tracts and 20 suburban areas, using population estimates and projections made by local authorities for each of these 70 areas.
2. Per capita sales estimates for proposed new stores were determined by taking into account: (a) the acceptance level of the existing Wards store, (b) an evaluation of local population and income, (c) the character of access routes and traffic, and (d) the effect of competition.

The completed market analysis for Fort Worth was forwarded to the Facilities Development Vice-President, the Real Estate Manager, and the Regional Manager responsible for operations in Texas. When the proposed sites became probable real estate transactions, the Store Research and Development Manager, and the Real Estate Manager jointly presented them to the Facilities Development Vice-President. With his approval, the project was formally presented to the President, the Chairman, and the Executive Committee of the Board of Directors.

Neither such a report nor the Store Research program of which the Fort Worth report is a small part can be developed quickly, even by a large corporation with extensive resources. As experience from the new Wards stores is fed back into the research base, techniques will be refined and the quality of analysis improved.

Wards' Store Research work, after two years of development, has gained management acceptance, but Wards recognizes that many years will be required to have its stores and its market in relative harmony. The task undertaken is a great challenge in marketing geography.

PROJECTING SALES POTENTIALS FOR DEPARTMENT STORES IN REGIONAL SHOPPING CENTERS

Harold R. Imus

Dr. Imus is Partner and Division Manager, Larry Smith & Co., Washington, D. C.

SINCE 1948, the planned regional shopping center has had tremendous growth as a major merchandising and investment vehicle. Projecting the sales potentials for department stores in such centers is becoming an increasingly more critical task in both department store and shopping center planning.

For purposes of this discussion, regional shopping centers are defined as planned projects usually under single ownership and having as principal tenant at least one department store branch with a store size in excess of 150,000 square feet of gross store area. These projects range in floor area size from 350,000 square feet to over 1,200,000 square feet. While this discussion relates to planned regional centers, the same general approach is applicable to calculating sales potentials for any branch store in any location.

Basic Materials

Development of sales potential projections for branch department stores in regional shopping centers utilizes as basic data readily-available information. The essential materials include the Census of Business, the Census of Population, highway access and location data, statistics as to the amount and kinds of competition in the area, and aerial photographs. Beyond these essentials, three other factors have major bearing on department store planning:

1. The share of the market which a particular parent store proposing a branch is already obtaining in its market area;
2. The corporate image of the store as a merchandising vehicle, particularly if the store specializes in either very high- or low-quality merchandise.
3. Management's attitude to merchandising. This is important in determining minimum store size. A management may feel that a branch store below a certain size cannot be representative of the parent company.

Sales Potential Projections

The procedures for projecting sales potential are based on the simple equation "Store Sales Potential Equals Total Market Minus Competition." Eleven steps are involved:

The Determination of a Trade Area for the Proposed Branch Store

Determination of a trade area is at least partly based on judgment. A number of observable factors must be considered. Primary among these are:

a. The arterial pattern.
b. The distribution of competition, both suburban and downtown.
c. The distribution of population.
d. The influence of physical or cultural barriers.
e. The strength of the parent depart-

ment store, in terms of its share of the market and its ability to be dominant over other facilities of a similar character.

f. The distribution and levels of income.

g. The results of actual branch store operation in analogous situations.

Where the department store proposing a new branch intends to join an existing regional shopping center in which another department store already operates a branch, the trade area can be approximated on the basis of distribution of the present customers of the operating store. However, even this information may not be completely conclusive because there may be a substantial difference in the types of markets which the two stores are proposing to serve.

A correctly defined trade area will encompass the concentrated population contributing approximately 85 per cent of the sales volume of the branch unit after it opens. The remaining 15 per cent will come from widely scattered areas, even from as far as several hundred miles away.

Subdivision of the Trade Area into Sectors

The trade area may be divided into two to five segments for purposes of determining the relative contribution of the various population groupings to the proposed branch unit. Population living beyond the proposed location for the branch on the side away from the central business district is likely to contribute at least twice as much sales volume per capita as the population living between the proposed project and the central business district.

The sales per capita curve has a skewed distribution. The curve tends to be relatively flat at the top, falls off rapidly in the vicinity of the 10–12 minute driving time zone, and then flattens out with a gradual slope to about 20 to 25 minutes' driving time. Driving time distance will vary somewhat depending on type of arterial access and city size. Trade areas tend to be more extensive for larger shopping centers in larger metropolitan areas, and smaller in the smaller centers that serve smaller cities.

Determination of Population, both Existing and Future, for Each Segment of the Designated Trade Area

Projections based on Census material or other data are developed for the segments as a whole rather than by Census tract. The tracts having the greatest growth at any particular time are likely to be filled quickly as housing developers complete their projects. Growth then moves on to the advancing suburban perimeter.

Determination of Income Characteristics

Family and unrelated individual income information is ordinarily developed by using Census tract material where available, or by house value or other indicator where Census data are not available. Per capita income determined by this method is useful primarily as an index of the extent to which the population in a particular portion of a trade area differs in department store expenditure characteristics from other areas and from the metropolitan area as a whole.

Establishment of Per Capita Department Store Expenditures

Per capita expenditures for department store-type merchandise are determined on the basis of Census of Business reports of department store sales adjusted by Federal Reserve Board index information for years subsequent to the Census. There are many pitfalls inherent in using these kinds of data, but

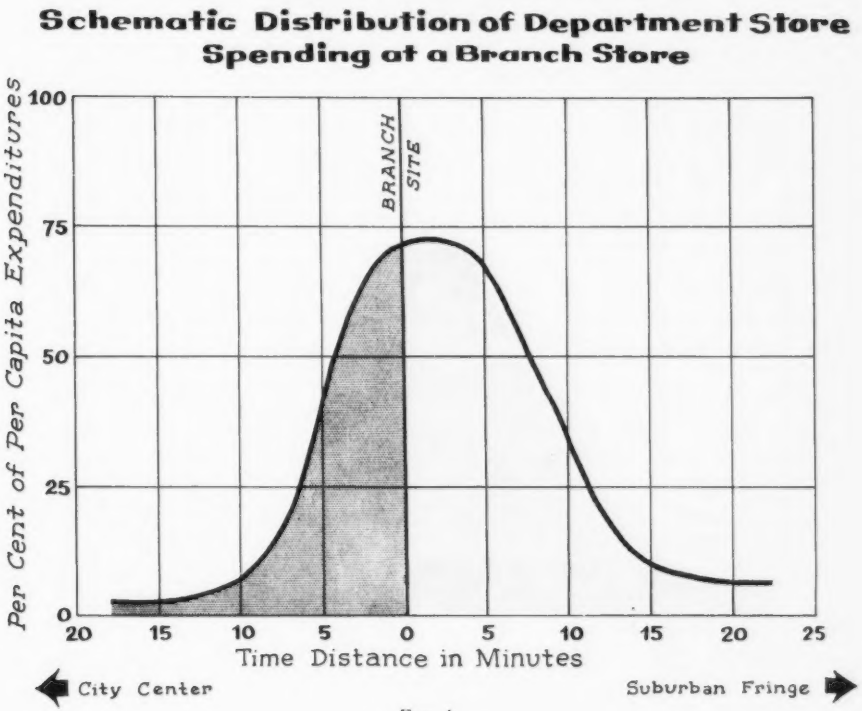

FIG. 1.

they are about the only reasonably reliable data available.

Using the per capita income figures for the trade area and comparing them with the metropolitan area average, adjustment may be made in per capita expenditures for the trade area in question. Ordinarily, the markets which new branches propose to serve have per capita expenditures which are higher than the metropolitan area average.

The Bureau of Labor Statistics has published consumer expenditure data for ten selected cities in 1948 through 1949,[1] and in a subsequent study on 90 cities.[2] Studies were also done by *Life* magazine in developing basic data on consumer expenditure characteristics by type of merchandise.[3] All of these studies indicate that per capita expenditures vary with income, but not necessarily directly as income varies. In other words, high-income families may spend proportionately less in department stores than middle-income families. Low-income families may make practically no department store purchases because their orientation is toward local, low-priced general merchandise, variety, and apparel stores.

Estimation of Total Trade Area Department Store Sales Potential

Total sales potential is simply the product of population times per capita

[1] *Family Income, Expenditure & Savings in 10 Cities*, The U. S. Department of Labor, Bureau of Labor Statistics, Bulletin No. 1065.

[2] *Family Income, Expenditure & Savings in 1950*, The U. S. Department of Labor, Bureau of Labor Statistics, Bulletin No. 1097, revised.

[3] *Life* Survey of Consumer Expenditures, Volume I, 1957. Published by Time, Inc.

expenditures. Total trade area sales potential indicates the amount of sales volume originating in the trade area to be divided among downtown stores, existing suburban branches, and the proposed new facility.

Estimation of Sales Potential Available to Suburban Department Stores

At this point in the analysis, it is necessary to determine the probable proportion of total sales potential which suburban branch facilities can obtain.

The suburban store proportion of total department store potential varies from almost zero in many cities to as much as 70 per cent to 85 per cent in some parts of the New York metropolitan area, where nearly all major stores have developed significant branches. In cities of between 200,000 and 400,000, the suburban retention approximates 35 per cent to 45 per cent and in cities with population in excess of 1 million, the figure approaches 50 per cent to 65 per cent. The suburban retention estimates of sales potential are applied on a trade area segment basis (Table I).

TABLE I

SAMPLE DEPARTMENT STORE SALES POTENTIAL CALCULATION—1960

	Primary zone	*Secondary zone*
Trade area population	50,000	50,000
Per capita expenditures	$150	$100
Total expenditure potential	$7,500,000	$5,000,000
% Suburban share	50%	50%
Suburban potential	$3,750,000	$2,500,000
Effective competition	1,300,000	300,000
Unsatisfied potential	$2,450,000	$2,200,000
Branch store share	50%	50%
Branch store potential	$1,225,000	$1,100,000
* * * *		
Total branch potential—two zones combined		$2,325,000
Desired volume per sq. ft.		$50
Estimated store size in sq. ft.		46,500 sq. ft.

Estimating Competition and Its Effect on New Branches

Sales potential available to a proposed new branch is further reduced by the effects of both existing and proposed suburban competition. Existing facilities are measured in the field, and a sales figure of between $40 and $70 per square foot is applied to the gross floor area to arrive at an estimate of the effectiveness of the competition. Competing department store facilities are not likely to close their doors simply because another department store management announces its intention to expand. On the other hand, existing suburban stores are likely to face some decline in volume as the market is divided among all those stores capable of competing for a share of the total potential.

Estimating Branch Store Sales Volume

If the department store proposing the branch is weak, compared to its competitors, and all probable competitors are represented, then subtracting the total sales capacity of the competitors from total trade area suburban sales potential is likely to determine the maximum sales potential of the new branch, and its size. If, on the other hand, the store proposing the branch is strong, perhaps dominant, and its competitors are weak, or are not represented by branches of their own, the proposed branch will be able to obtain its reasonable share of the market almost without regard to competitors' present capacity and willingness to serve the needs of trade area residents. A strong store can obtain somewhere between its present share of the metropolitan market and double that share of the suburban sales potential at a well-located branch, pro-

vided the store is large enough to be representative of its parent store downtown.

Not all department stores present in a market are necessarily able to develop branch stores, no matter what the wishes of their management. Some of the stores in the larger metropolitan areas have such a small share of the market that if they should attempt development of branches, any such branches would be so insignificant in size as to function more as specialty stores than department stores, and would serve primarily the apparel market. In markets where one or two of the smaller downtown department stores find themselves in this position, it is probable that the stronger stores' branches will serve the sales potential to which they are entitled and, in addition, will absorb the suburban sales volume which the weaker department stores are unable to serve in the suburbs.

Determination of Branch Store Size

Store size is calculated by dividing sales potential by the proposed design sales volume factor. In most instances, this factor is approximately $60 per square foot of gross area, although it may range from $40 to $75 per square foot, depending upon management intent and the necessity to maintain or increase dominance and accommodate future growth potential in the area.

Checking the Conclusions

Having determined probable store volume and size, the question then remains of deciding whether or not the store size capable of support by the trade area is sufficiently strong to influence the area which it is proposing to serve. In smaller metropolitan areas, the total population which can be served in any one suburb is likely to be relatively small, so that the branch store will similarly be small. It is a matter of management decision as to whether the branch is worth pursuing, taking into account effects on the downtown store (the transfer of sales volume), and also the capital requirements and diversion of management's attention.

In many cities of less than 300,000 population, department store managements reach a negative conclusion and postpone branches, at least temporarily. This is especially the philosophy of the stronger stores, whose branches are usually their downtown parent stores' strongest competition. Frequently, the initiator of rapid branch expansion is a non-dominant store, possibly the second or third store in terms of rank based on sales volume. Such a store might attempt to improve its position at the expense of the dominant store. The latter in turn might permit such competitive action without retaliation until such time as the competitor's branch units make substantial inroads into its sales volume. Then a major branch facility might be undertaken by the dominant store for defensive purposes. Dominant store management strategy in such cases emphasizes the fact that continued loss of position to competitors is worse than transfer of sales volume from the parent store to the branch store.

With respect to the transfer of sales volume from parent to branches, strong stores will face transfer in early years of branch operation of as much as 25 per cent to 40 per cent of suburban branch sales volume. However, with the passage of time and growth in the market as a whole, the transfer effect of branches disappears.

It is probable that in cities in which department stores are aggressively defending their position against the specialty houses and chain stores, there will be an increase in the department

stores' share, collectively, of the total market. In this manner, the way may be opened for additional branch expansion and development of still more regional shopping centers.

* * *

A CASE STUDY

An actual case study, with the area involved and the name of the department store withheld, is included in this paper to illustrate the principles discussed throughout. The basic questions raised by the department store management for whom this study was prepared were:

1. How much sales potential is available in the trade area of the proposed branch?
2. How much sales volume would the proposed branch achieve in that location on opening and on maturity?
3. How large should the store be?
4. What will be its effect on the parent store downtown?

* * * *

A SUMMARY OF DEVELOPMENT OPPORTUNITIES FOR STORE X AT RIVER PLAZA SHOPPING CENTER

The location being considered by *Store X* is the River Plaza Shopping Center property currently occupied in part by an existing shopping center development whose major tenant is a 200,000 square foot Store Y unit, and which is apparently capable of expansion to accommodate a *Store X* unit of comparable size, as well as some additional other retail facilities.

Access to the existing shopping center is adequate from all parts of the trade area. The development has a typical suburban shopping center characteristic in that over 90 per cent of the customers at the project reach the center by automobile. Public transportation is of little importance to the River Plaza Center. This is of special significance in view of the dependence of *Store X*'s other unit, which will be influenced by River Plaza, upon public transportation to bring customers to the store.

Trade Area and Population

The trade area which is tributary to the existing River Plaza center is relatively extensive, covering all of southern Bowman and a portion of southwestern Harris County, as shown in Figure 2. The existing project shows a high degree of dependence upon the primary zone of the trade area for its sales volume. A recent customer survey indicated that over 71 per cent of the total River Plaza customers resided within the primary zone of the trade area as it has been drawn here. An additional 14 per cent of the customers resided within the secondary zone, and the remaining 15 per cent resided outside of any logical trade area borders which could be drawn.

Trade area population at the present time is very high, totalling approximately 986,600, with 355,500 of these persons residing within the important primary zone. Population growth since 1950 in the trade area has been at a relatively high rate—8900 per year—but it is expected that this growth rate will decrease in future years, due mainly to the approach of population saturation in Bowman, and to a lesser extent in southwestern Harris County. It is expected that by 1960, the primary zone of the trade area will have a population of 373,300, increasing by 1965 to 400,000 and, by 1970, to 417,700. It is expected that the total trade area will have a population by 1970 of somewhat over 1,050,000.

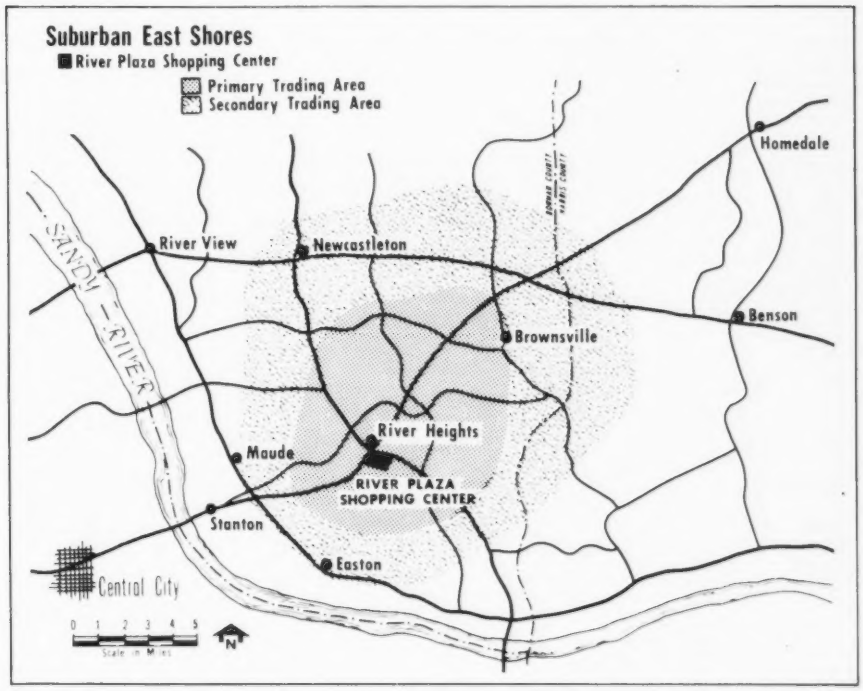

FIG. 2.

Income and DSTM (Department store-type merchandise) Expenditures

Income levels in the trade area are relatively high, averaging approximately $2500 per capita in the primary zone and $2425 per capita in the secondary zone. The trade area average is somewhat over $2450 per capita.

It is estimated that approximately $370 per capita would be spent for major DSTM items by residents of the primary zone of the River Plaza trade area. Of this total, approximately $135 per capita would be spent in department stores, with the remaining amounts being divided among variety, apparel, and furniture and appliance outlets. In the secondary zone, DSTM expenditures would be only slightly less—$360 per capita—with the department store expenditures again approximating $135 per capita.

Sales Potential

As a result of the very high trade area population, the total department store potential generated within the trade area in 1960 is estimated at approximately $125,300,000, increasing by 1965 to $136,300,000. Of this total department store potential, it is estimated that about 70 per cent would be retained by *suburban* department store facilities. Thus, in 1960 the total suburban potential would amount to about $87,700,000, increasing to $95,400,000 by 1965. This potential would, of course, be available not only to the proposed store, but also to all of the other existing department store facilities in River Heights, Stan-

TABLE II

MAJOR DSTM SALES POTENTIAL
(000's)

	Per capita expenditure	*Total sales potential*			*% Suburban share*	*Suburban potential*			*Effective competition*	*Unsatisfied potential*			*% Center's share*	*Center's share*		
		1960	*1965*	*1970*		*1960*	*1965*	*1970*		*1960*	*1965*	*1970*		*1960*	*1965*	*1970*
PRIMARY ZONE (Population		373,300	400,000	417,700)												
Dept. store.....	$135	$ 50,396	$ 54,000	$ 56,390	70	$ 35,277	$ 37,800	$ 39,473	$ 15,869	$ 19,408	$ 21,931	$ 23,604	80	$15,526	$17,545	$18,883
Variety.....	35	13,066	14,000	14,620	85	11,106	11,900	12,427	5,818	5,288	6,082	6,609	55	2,908	3,345	3,635
Apparel.....	130	48,529	52,000	54,301	75	36,397	39,000	40,726	17,622	18,775	21,378	23,104	60	11,265	12,827	13,862
Furn. and appl...	70	26,131	28,000	29,240	80	20,905	22,400	23,392	10,089	10,816	12,311	13,303	50	5,408	6,156	6,652
Total.....	$370	$138,122	$148,000	$154,551	..	$103,685	$111,100	$116,018	$ 49,398	$ 54,287	$ 61,702	$ 66,620	..	$35,107	$39,873	$43,032
SECONDARY ZONE (Population		554,800	609,600	637,000)												
Dept. store.....	$135	$ 74,898	$ 82,296	$ 85,995	70	$ 52,429	$ 57,607	$ 60,196	$ 33,467	$ 18,962	$ 25,140	$ 26,729	40	$ 7,585	$ 9,656	$10,692
Variety.....	30	16,644	18,288	19,110	85	14,147	15,545	16,244	11,077	3,070	4,468	5,167	35	1,074	1,564	1,808
Apparel.....	125	69,350	76,200	79,625	75	52,012	57,150	59,719	30,931	21,081	26,219	28,788	35	7,378	9,177	10,076
Furn. and appl...	70	38,836	42,672	44,590	80	31,069	34,138	35,672	20,448	10,621	13,690	15,224	35	3,717	4,792	5,328
Total.....	$360	$199,728	$219,456	$229,320	..	$149,657	$164,440	$171,831	$ 95,923	$ 53,734	$ 68,517	$ 75,908	..	$19,754	$25,189	$27,907
TOTAL TRADE AREA	....	$337,850	$367,456	$383,871	..	$253,342	$275,540	$287,849	$145,321	$108,021	$130,219	$142,528	..	$54,861	$65,062	$70,936

ton, Brownsville, Newcastleton, and other retail areas in this portion of East Shores (Fig. 2).

It is estimated that the existing department store facilities (exclusive of those at River Plaza) which influence the River Plaza trade area comprise an effective competition for approximately $49,300,000 of suburban department store potential. Exclusive, then, of the volume which would continue to be available to existing stores, the unsatisfied department store potential from within the entire River Plaza trade area is estimated at approximately $38,400,000 in 1960, and $46,100,000 in 1965. It is estimated that the entire River Plaza project, including the proposed unit of *Store X*, could expect to obtain approximately 80 per cent of this total unsatisfied potential from within the primary zone and an additional 40 per cent from within the secondary zone. Thus, by 1960 the total development would have a department store potential of about $23,100,000, increasing by 1965 to $27,200,000. At a stabilized sales level of $60 per square foot, the 1965 department store volume would warrant approximately 455,000 square feet of department store space at River Plaza. Thus it is apparent that there would be adequate opportunity for a unit of *Store X* of approximately 200,000 square feet to be added to existing department store facilities at River Plaza.

The Share of the Market Available to Store X

In combination with *Store X* units in other parts of East Shores, the River Plaza unit could probably influence its trade area sufficiently to increase the over-all *Store X* share of the suburban market from 30 per cent to as much as 40 per cent. At the mid-point of this range—35 per cent—about $30,700,000 would be available to the *Store X* organization in 1960, rising to $33,400,000 by 1965. Of this total, *Store X* in River Plaza could expect about 75 per cent from the primary zone and 25 per cent from the secondary zone. In 1960 this could afford a volume of about $13,800,000 to *Store X* in River Plaza, rising by 1965 to over $14,900,000.

On the basis of a stabilized sales level of $60 per square foot, this volume would warrant a unit of *Store X* at River Plaza of about 230,000 square feet in 1960.

All of these calculations that have been described are summarized in Table II.

Conclusions

From the above, it is apparent that there is an opportunity for *Store X* to develop a major branch unit of a size at least comparable with the existing unit of Store Y, or 200,000 square feet, in the River Plaza Shopping Center at River Heights. This analysis of the volume potential available has indicated, however, that the problem of volume transfer from existing *Store X* units at other East Shores locations will be important in this situation. This is due primarily to the fact that there is some duplication of coverage of trade areas between existing *Store X* units and the proposed unit at River Heights. (In the complete version of this report, the question of the extent of volume transfer was considered in detail.)

THE ORGANIZATION OF LOCATION RESEARCH IN A LARGE SUPERMARKET CHAIN

Jack C. Ransome

Dr. Ransome is Manager, Store Location Research Department, The Kroger Co., Cincinnati.

AN unnecessarily large number of retail businesses fail each year because of inadequate market research and poor location planning. Many supermarkets are included in the toll, some lasting no more than a year. Others remain open, but fall so far below their predicted sales budgets that they place an extra burden upon successful stores of a company. The investment of a modern supermarket normally exceeds a quarter of a million dollars. Annual sales of a store may exceed five million dollars, and net profits of $75,000 to $100,000 per year are not uncommon.

The heavy investment in each supermarket demands a greater coincidence between sales prediction and sales performance. A number of supermarket chains have established location research departments for this purpose. This paper discusses the example of one large chain, The Kroger Co. Attention is devoted to:

(1) The organization and procedures whereby stores are conceived, remodeled, or replaced.

(2) The specific tasks of the company geographer and his location research section.

(3) Some useful concepts and tools used in location analysis.

The Kroger Co. operates 25 divisions in 21 Midwestern and Southern states (Fig. 1). Each division is semiautonomous in its operation.

In most cases, initiation of a new store project begins in a division office. Each division is responsible for developing its own store program. The division real estate manager works out a program with the division vice-president who in turn submits it to general office in Cincinnati for review and approval. Subsequently, the division real estate manager submits the individual store projects with pertinent supporting data, and with recommendations as to location, store size, parking, sales budget, and lease terms.

The major task of evaluating the store project in general office falls upon the real estate department. This department has two arms: a location research section headed by a geographer; and a leasing section consisting of several highly-experienced real estate men who have worked in various division territories.

Location Research Section

The location research section was created about five years ago when the company observed that some stores exceeded their sales and profit budget by as much as 75 per cent while others ran well below budget. Each new store, remodel, or store consolidation proposal now is channeled through this section. The unit is staffed with two assistants in addition to the geographer. The geographer has the responsibility of training research assistants in store loca-

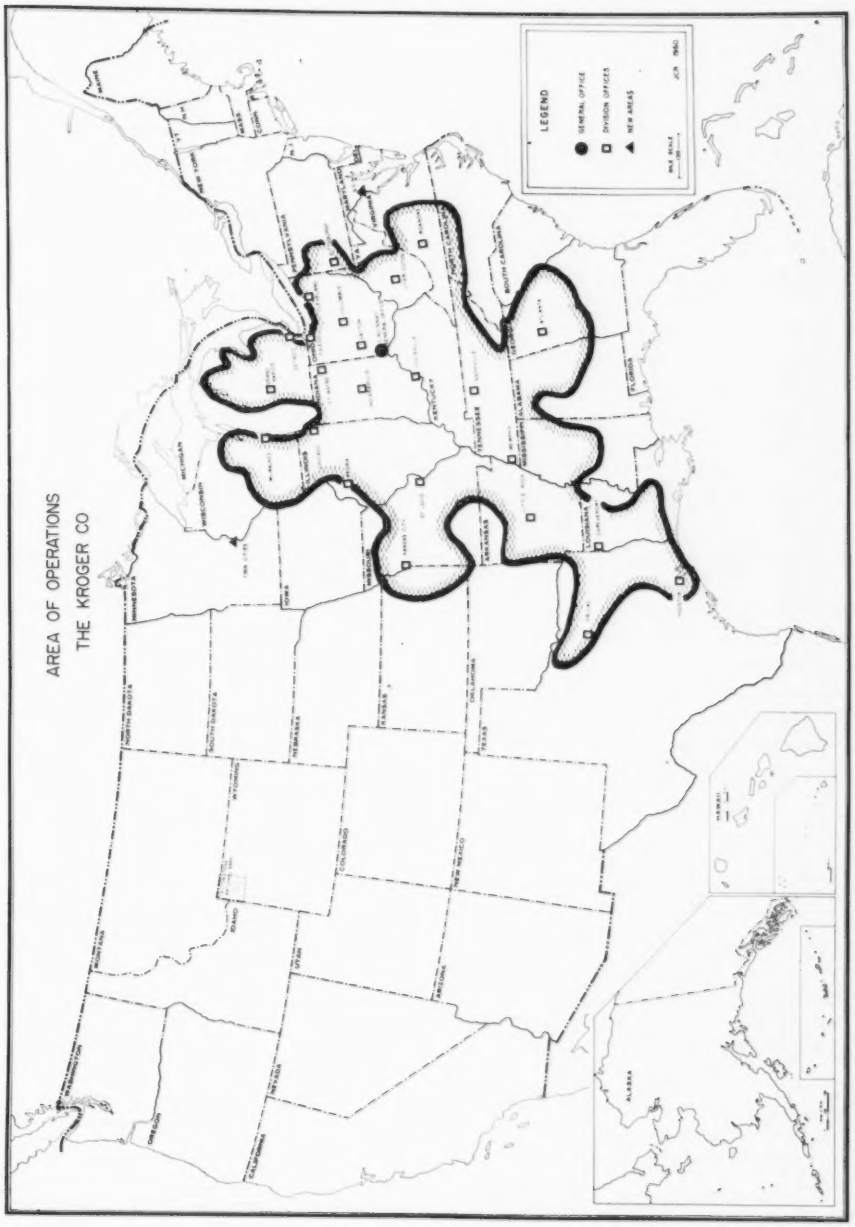
AREA OF OPERATIONS
THE KROGER CO
LEGEND
GENERAL OFFICE
DIVISION OFFICES
NEW AREAS

FIG. 1

tion principles and techniques. Within a year or so an assistant moves to a division office and is trained there in negotiating leases and in other real estate aspects. The college major of most research assistants has been marketing, but there is no reason why geographers with an interest in a real estate career should not be represented.

LEASING SECTION

The leasing section of the real estate department advises and assists in field lease negotiations, processes leases and other papers on approved deals, provides staff assistance on special projects such as new warehouses and manufacturing plants, and develops and leases company-built shopping centers. Both the location research and the leasing section analyze new store proposals, and in a sense, each casts one vote. Leasing section personnel look at a proposal from the basis of their experience in particular divisions. The leasing section may vote against a project unless land costs can be reduced, or the length of the lease, the rent level, or other real estate features can be more satisfactorily negotiated.

FINAL DECISION ON PROJECTS

The real estate department serves as a recommending body. The final decision on most store projects is made after consultation with the real estate department manager. There is also coordination with regional vice-presidents, each of whom is responsible for a group of divisions. In circumstances involving policy or unusual expenditures, the company president is consulted.

FUNCTIONS OF THE LOCATION RESEARCH SECTION

The location research section analyzes some 200 new store, remodel, and consolidation projects each year. After a division has submitted a proposal, the first step in analysis is a test of the supporting data. For instance, is the anticipated store trade area reasonable as outlined? One method of determining this is by reference to examples of the hundreds of supermarket trade areas mapped by the location research section. Such maps made from plotting customer addresses show distinct trade area patterns for stores of various sizes and in varying types of location. Thus, a typical 15,000 square foot supermarket in an unplanned neighborhood business district obtains about 65 to 70 per cent of its total sales from within a one and one-half mile radius. In contrast, a supermarket in a large planned shopping center may obtain only 50 per cent of its customers from within one and one-half miles.

A major function of location research is to substitute knowledge for surmise. Thus, if a division project form states that a new store will draw customers from the other side of a river without supporting evidence, general office may advise the division real estate manager to make a license plate survey of cars leaving the parking lot of a competitor in the area. The distribution pattern of customers will tell whether the bridgehead is a barrier or a connective. Railroads, rivers, and hilly topography have different degrees of obstruction. The major factor which limits a trade area boundary may not be the existence per se of a physical barrier, but (1) whether effective traffic flow can occur across the barrier, and (2) whether a competitor on one side or the other can strongly reinforce the barrier. In West Virginia hills, where intervening opportunities to shop at supermarkets are few and far between, customers will drive 15 to 20 miles over narrow, winding roads to reach a store.

The location research section examines

the population data submitted by the Division in each proposal to make sure that valid interpretations were made. Trade areas with less than 20,000 persons constitute a considerable gamble for a proposed supermarket with desired sales of more than $30,000 per week. The sudden flush of several new subdivisions can be easily misinterpreted as the beginning of a solid growth pattern. Attention must be given to the residential growth capacity of a specific trade area. How much land is likely to be zoned for residences, of what type, and at what rate of development?

Kroger divisional real estate men are learning that there is no substitute for an up-to-date population distribution and growth map. Once a population dot map has been constructed, division sales budgets become more realistic. By reference to building permit data, and highway and utility development plans, the Kroger Division real estate manager can better decide whether to encourage the company to proceed with a new store even though present population might be sparse. The location research section checks the timing of each proposal against the master plan of the division. If the proposed supermarket location is by far the best in the trade area, or a top position in a shopping center is offered, the location research section may recommend building a new store ahead of the original schedule. In mature neighborhoods, a new supermarket must depend upon the existing potential. Normally, such areas offer no extra sales cushion in the future, and, in fact, may decline in population and average income.

Population distribution is almost as important as number. The critical factor is whether there are enough people within a mile of the store to form a dependable core of high-value customers. If the bulk of trade area population live beyond a mile from a supermarket, competition can very easily siphon off business at the outer rim, or act as short-stops along the radiating arteries of the trade area. Per capita weekly food sales drop very rapidly from the inner to outer distance zones of a store.

The location research section also considers data submitted relative to accessibility to sites, the possibility of superior sites, the number and quality of competitors, and the changing nature of retailing and the general economy of the area. The geographer performs a basic overall company planning function. He raises questions such as: how are stores to be arranged in one, three, five or more years to best serve the company in any given area? Considering changes in a community, what type of store is desirable on each site? How will a store plan be effected step by step? What will be the impact of new stores upon existing company stores? Can two stores co-exist in a given area, or will an older store be cannibalized? Is it possible to find a new store site which is more suitable to the present arrangement of Kroger stores?

SURVEYS OF NEW MARKETS

A task of increasing dimensions for the location research section involves the survey of new markets. Usually, this begins with an inventory and mapping of competition facilities. Geographers in several universities have conducted such surveys for The Kroger Co. The company analyst estimates the present and near future population and food sales of the new market. The competitors' share of market is weighed against the total food sales potential to establish the degree of supermarket storing in the community. Thus, if supermarket companies already account for 75 to 80 per cent of all food sales of a metropolitan area, entry of another

company may be more difficult. At times, supermarket companies have been so concerned about representation in an area and matching competition facilities, they have lost sight of the fact that all markets have a finite potential.

Location research and leasing section personnel make field reconnaissances for sites in new market areas and submit reports on the opportunity for Kroger entry. The real estate manager and other executives also spend a great amount of time looking over new territory.

REANALYSES OF STORES AFTER OPENING

After each store project is completed and in operation a year, the location research section reanalyzes. Not only do reanalyses detect some causes of deviations from the budget, but they also furnish a fresh batch of data so that locational hypotheses may be revised to fit changing types of stores. Empirical data are directly useful only when the company is building stores comparable to those contributing to the data.

Map analysis of a new store trade area often exposes sectors of poor penetration, and, as a result, store promotion and advertising can be concentrated in those areas. Or, analysis may reveal that a supermarket is obtaining fine coverage and a high share of the market, and, therefore, very heavy store promotions will cost more in profits than they would gain.

SPECIAL RESEARCH PROJECTS

In the past, most of the time of the location research section has been devoted to "fire-fighting," that is, day to day decisions on immediate projects. However, one very important objective of the section is to extract those repetitive patterns of location, facilities, and market characteristics which produce successful stores. The company universe of 1400 supermarkets provides research material in abundance.

Briefly, here are some research results or projects still underway:

(1) The criteria of entering small towns with a supermarket have been carefully defined. For towns of 5000–10,000 population it may be necessary to achieve 25 to 30 per cent of all food sales in the town in order to build a profitable 10,000–15,000 square foot supermarket. The median share of total food sales accomplished by company stores has been determined for towns and cities of various sizes and potentital.

(2) It has been determined by size of town or market what the traffic will bear in supermarkets. As has long been known, markets of a given potential will support comfortably certain types and numbers of retail units. For example, a city of 40,000 normally is quite adequately stored with six to seven supermarkets. In most cases, the company operates only one store in towns smaller than 35,000–40,000 population.

(3) The proportion of customers likely to come from various distance zones has been worked out by type of store. Neighborhood stores have a much higher percentage of walking customers and more compact trade areas while shopping center stores have more dispersed patterns as related to the strong draw of the center and the high ratio of driving customers. Customer distribution patterns are of special relevance when relocating a store. If the

new store is relocated at quite a distance from the old, it may be difficult to transfer much walking customer business.

(4) In metropolitan areas, studies continue on what per capita food sales may be expected in each radius zone of a supermarket trade area. The medians vary according to the type of store, associated retailing, and the degree to which competitors dilute the store's penetration.

(5) Research is underway to build statistical models of various store types. Each model trade area will be considered as a series of small numbered grids. Each grid will have assigned values of population density, income groupings, and food sales potential. Company experience can be plotted visually or by computer against the potential grids. Only one computer run has been made so far.

Geographers should be participating in larger numbers in these activities. The pace of location research in supermarket chains can be expected to accelerate and other businesses undoubtedly will borrow its approach and some of its methods.

TEACHING MARKETING GEOGRAPHY BY THE CASE METHOD

William Applebaum

Mr. Applebaum is Visiting Lecturer on Food Distribution and Comparative Marketing, Harvard School of Business Administration, and has pioneered in the field of marketing geography.

IN a previous paper the author stated that ". . . the best place to develop the field of marketing geography is in business. The marketing geographer should either work for business full time or should seek to conduct research for business on a part-time consultant basis . . . the application and evaluation of ideas and methods needs the laboratory of actual business operations."[1]

In the seven intervening years, geographers have made considerable progress along these lines. The papers that have preceded this one are by five geographers all of whom are applying their professional skills to the solution of important business problems. Together, the companies which they serve do an annual volume of sales amounting to several billion dollars. The annual investment of these companies in new stores, warehouses, shopping centers, and other facilities runs into many tens of millions of dollars. The business executives who must make the ultimate decisions as to how to employ and direct both the old and new investments depend on these geographers for compilation of data, sound analysis and interpretation, and specific recommendations for action.

[1] William Applebaum: "Marketing Geography," in *American Geography: Inventory and Prospect*, Syracuse, N. Y., 1954, p. 245.

The Geographer's Role in Solving Problems

The growing role of geographers in business signifies that our profession has something worth while to offer to business. This "something" is professional help in solving problems. Solving problems involves decision making. Decision making, in turn, rests on expectation or prediction, when possible.

That geographers can and should play such a role in society is clearly affirmed by Hartshorne, who states that: ". . . geographers may hope to provide counsel as well as information pertinent to planning for the future . . . they may be able to provide greater assurance of continuance of trends than the mere fact that the trend exists. . . . In numerous cases also geographers may have sufficient knowledge of the relationships involved to permit somewhat more positive 'predictions' . . . the geographer as a responsible member of society has an obligation to make his knowledge useful to society. . . ."[2]

In arriving at specific recommendations for business action, geographers must consider many choices of possible action. They take into account short and long term objectives of the companies they serve. They weigh ad-

[2] Richard Hartshorne: *Perspective on the Nature of Geography*, Chicago, 1959, pp. 165–166.

vantages and disadvantages of alternate sites, of size of facilities, of timing each new investment move. They consider the probable effect of each new facility on already existing company facilities. They even try to anticipate certain moves which competing companies are likely to make in a dynamic competitive environment. In short, these geographers deal with problems of business strategy, not as encyclopaedists but as business planners and consultants.

Generally, there is no single correct, demonstrably sure answer to a business problem. All the pertinent factors which affect the answer are never known. And business decisions are made by human beings with complex motives. The professional geographer in business is also first a human being and second a scientist trying to do a respectable job. He has to deal with other human beings and tries to influence their decisions and actions. This is a difficult and delicate task. Even if the geographer has the right answer to a problem, it becomes valuable to the company only when accepted and used. The professional geographer in business cannot expect to find his answers to specific problems in broad generalizations and neat formulas.

Here, too, it is worth quoting Hartshorne: ". . . in order to explain fully by scientific laws of cause and effect a single decision of any single human being, we would need . . . far more data that we could ever hope to secure. Further, if the necessary data concerning all the factors involved were somehow made available, and we had established scientific laws explaining the interrelationships of these factors, what method would we have for integrating such a multiplicity of diverse laws involving many incommensurable factors? Finally, if both the impossible difficulties were overcome, so that we could reduce all the factors to common measure and express the total complex in mathematical form, that equation would be so complex as to be beyond solution by finite minds."[3]

These considerations, though sketchy, indicate that the geographer who chooses to apply his professional skill to the solution of business problems, needs training in both the art of prediction and in the art of business decision making.

THE CASE METHOD—A PEDAGOGICAL TOOL

Over 13 years ago, while I was actively engaged in research work for a large corporation, I tried to suggest some needed training for geographers who wished to apply their profession in business.[4] In the last five years, after a career of nearly a quarter century in both business research and administration, I have been devoting a substantial part of my efforts to the art of teaching at the Harvard Business School. At this graduate school teaching is done almost entirely by the case method. For me this has been a remarkably profitable experience. I had no previous exposure to, nor experience with, the case method of teaching. Furthermore, I have had to develop my own case material with the help of young assistants. Several of the cases which I use involve marketing geography problems. I believe these cases are effective teaching tools. Hence, I am proposing that teachers of geography consider the case method of instruction for certain subjects at the graduate level, to help prepare geographers for professions in business.

Current methods in teaching geography embrace lectures, laboratory in-

[3] *Ibid.*, p. 155.

[4] William Applebaum: "The Geographer in Business and His Requisite Training," *Prof. Geogr.*, April, 1947, pp. 1–4.

struction, field trips, report writing, and seminars. The case method is currently not used in teaching geography. In the teaching of law, medicine, and business administration, the case method has proven to be an effective and valuable tool. In law the teaching cases are derived from the records and reported decisions of the courts. In medicine, the student studies the living patients in the clinics and hospitals. In business administration the cases are drawn from the actual experience of business enterprises.

A business case typically presents a problem or issue which is or has been faced by business executives. This problem or issue is set forth with surrounding facts and known articulated opinions and prejudices. The relevant data are reported carefully and accurately. The case is structured and presented in a manner that compels the student to study the material analytically with the view of arriving at a decision as to what action might be taken to meet or solve the issue.

OBJECTIVES OF TEACHING BY THE CASE METHOD

The main objective of teaching by the case method is to develop the student's capacity to think analytically and imaginatively and to learn the art of arriving at a reasonable decision on the basis of available information and related considerations. The teaching of facts, methods, theories, and generalizations is done in a "realistic" situational setting. The student's acquisition of this knowledge is important, but more important is the development of an ability to think one's way through concrete problems.

Learning by the case method is very demanding of both the student and instructor. The student is expected to come to class prepared to discuss the case with his fellow students and instructor. He must accept and defend challenges; he has to evaluate the views of others; he needs to learn to modify and enlarge his own views; and he must conduct himself in an intellectually democratic spirit. At the end of the class each student leaves with better ideas and wider horizons than he had himself at the beginning. Furthermore, the student soon develops the realization that regardless of how well-prepared he comes and how intelligent he is, the pooling of ideas, knowledge, and experience of many active minds is an intellectual adventure.

The case method demands of the instructor a thorough knowledge of the case and preparation in great depth, as well as skill in guiding the discussion. The instructor does *not* lecture. When the students are well-prepared and enthusiastically interested in a case, the instructor may find it almost unnecessary to participate in the discussion. His task is always to keep the channels of communication open and to stimulate the students, by well-placed questions, to come to grips with the major aspects of the case. He may restate and tie the threads of the discussion together; he may deliver a brief "lecturette" to supply special, related information; and he may express a personal opinion. The burden of the discussion, however, must stay with the students.

Since the instructor cannot anticipate exactly how a case discussion will develop and since he does not know when an unexpected, fresh point of view will emerge, he must preserve open-mindedness. Furthermore, because there is generally no sure right answer to a business problem, or to any problem involving human decisions, there is always the possibility that the instructor does not know the best answer. The

case method teaches the instructor as well as the student.

INTRODUCING THE CASE METHOD

The case method, I believe, could be an effective device for preparing geographers to apply their professional specialties to the solution of concrete problems involving the spatial ordering of economic and other human activities. As a starting point, I suggest the introduction of the case method in the teaching of marketing geography. Elsewhere I have attempted to define the field of marketing geography.[5] The preceding papers present impressive evidence of marketing geographers in action. They all have, I may add, helped me in varying degrees in the preparation of several teaching cases involving marketing geography problems.

Since the field of marketing geography is still quite new to us, and since teaching geography by the case method is still essentially an unknown, we need a combination of dauntless pioneers and enthusiastic volunteers to explore the promising merits of the case method. We are currently in the midst of a national soul-searching of our entire educational system and its teaching methods. We are also in a new era of experimentation with educational devices. Geographers are not untouched by these powerful forces. I hope that a few geographers will venture to investigate the possibilities of the case method as a teaching device. As a starting reference I recommend a group of papers by members of the Harvard Business School faculty.[6] This should be followed by examination of some of the case textbooks on various problems in business administration and by auditing classes where the case method is used.

It is very likely that geographers will find it desirable or necessary to introduce modifications and innovations of their own in developing and designing teaching cases. Certainly, the use of cartographic devices will be a challenging opportunity, but so will be the use of statistical devices. The development of each case will require substantial research, and the structuring and presentation of the issues and relevant data will call for a measure of creative literary skill.

The raw case material will have to come from the records and experience of business enterprise. Hundreds of enlightened business firms are already cooperating gladly with professors and researchers in the creation of teaching cases. With the proper approach, geographers too can open up resources for such pedagogical treasure. Every geographer employed by business is a potential collaborator or even author of one or more cases. Every opportunity to do geographic consulting work may yield a teaching case. On occasion the development of a teaching case will, in turn, generate an opportunity to do geographic consulting work.

If beginnings are slow and difficult, perhaps geographers may want to try out the case method in seminar courses or as supplements to lectures. Regardless of how this is done, let it be done.

CONCLUSION

In conclusion I would like to point out that geographers *are* interested in cases. Certainly much if not most of what geographers have written consists of case description of areas, activities, and problems. Furthermore these geographic case descriptions are being used as teaching materials in seminars and

[5] William Applebaum: "Marketing Geography," in *American Geography—Inventory and Prospect*, *op. cit.*, pp. 245–251.

[6] *The Case Method at the Harvard Business School*, papers by present and past members of the faculty and staff, edited by Malcolm P. McNair and Anita C. Hersum, McGraw-Hill Book Company, Inc., New York, 1954

as supplementary reading. What this paper proposes is that geographers devote some of their efforts to writing cases strictly as teaching devices whose primary objective is to develop the art of solving problems and making decisions.

Geographers who undertake to introduce the case method in marketing geography in their teaching at the university must be ever-ready to broaden the horizon of their personal experiences as applied geographers, and to articulate these experiences. They must maintain intimate contact with the universe of data-gathering, analysis, and decision-making that surrounds geographers in business. This is a challenge and undertaking that can and should be met not solely on an individual basis, but rather by organized talent of our profession.

* * * *

A CASE STUDY

The following case deals with a store location problem which The Kroger Co., a large corporate supermarket chain, faced in Zanesville, Ohio, in the fall of 1957. In resolving this problem, the company had to take into consideration both geographic and financial factors. These considerations revolved around store location strategy for securing an optimum share of the food business available in the Zanesville market, with a maximum return on investment. The marketing geographer must apply here his professional skills to assist business in solving a practical problem.

TABLE I

THE KROGER CO.: COMPARATIVE FIGURES FOR THE TWO STORES IN ZANESVILLE, 1957

	Downtown	*Country Fair*
Year opened	1951	1956
Last remodeled	1956	....
Lease expires	6/30/61	6/30/66
Renewal options	2–5 years	2–5 years
Investment in equipment and leasehold at book value 12/28/57	$26,800	$106,900
Size	75′ x 163′	100′ x 160′
Checkouts	8	7
Parking space	83 cars	800 cars*
1957 annual sales	$1,898,000	$1,508,000
Estimated 1957 net profit before taxes	4.2%	3.5%
Distance to Maysville Pike shopping center site	2.7 miles	6 miles

*Used jointly with other stores in shopping center.

THE KROGER CO.: SUPERMARKET CHAIN—SELECTION OF ADDITIONAL SITE[7]

In 1954, in order to compete effectively for a larger share of the available food business in Zanesville, Ohio, The Kroger Co., which operated a large supermarket in the downtown area of the city, contracted for a second store, in the Country Fair Shopping Center in the northeast section, at the same time rejecting an offer of another site on Pierce Street in the southwest section. The existing store in Zanesville had been opened in 1951, upon the consolidation of five smaller Kroger stores, and had consistently surpassed expectations as to sales. The second store, at Country Fair, was opened in June, 1956, and after the first year it too recorded a sales volume which exceeded expectations. (Comparative figures for 1957 are given in Table I and the results of a customer survey on December 6 and 7, 1957, are shown in Table II.)

In the late fall of 1957, the real estate manager of the Columbus division, in which the Zanesville stores were included, was offered still another store site in Zanesville, in a proposed strip shopping center at Maysville Pike and

[7] Case material of the Harvard Graduate School of Business Administration is prepared as a basis for class discussion. Cases are not designed to present illustrations of either correct or incorrect handling of administrative problems. Copyright ©1959 by the President and Fellows of Harvard College.

TABLE II

THE KROGER CO.: 1957 CUSTOMER SURVEY

	Downtown	*Country Fair*
Total customer count Friday and Saturday	5,094	3,818
Customers interviewed:		
Number	349	437
Percentage	7%	11%
Residence:		
North sector	10%	67%
East sector	50	13
South sector	40	20
	100%	100%
Miles traveled to store:		
0–1	35%	10%
1–2	19	27
2–3	4	15
3+	42	48
	100%	100%
Type:		
Female	56%	63%
Male	26	16
Couples	18	20
Children	.....	1
	100%	100%
Frequency of store visits: Times per week:		
1 or less	67%	75%
2–3	24	19
3+	9	6
	100%	100%
Mode of travel to store:		
Automobile	77%	99%
Walk	21	1
Bus	2	.....
	100%	100%
Length of store patronage:		
Since opening	68%	82%

Clay Street, at the southwest edge of the city. It was necessary for the real estate manager immediately to draw up his recommendation to the regional vice president since the opportunity to go into the new center would not be available much longer. He was aware that in arriving at a decision the management would be concerned not only with the likelihood of success of a Kroger store at this site but also with the effect of such a store on the other two Kroger stores in Zanesville and with Kroger's future competitive position in the city in the event that a competitor instead of Kroger established a store in the proposed shopping center. He was aware also that management must weigh carefully all the factors involved in choosing a new location, even if sometimes a delay might result in losing relative position and share of the market.

The Kroger Co. in 1957 was the third-largest supermarket chain in the United States, ranking only below A&P and Safeway. It operated over 1400 stores, ranging from converted service-type superettes to large modern supermarkets, in 21 states extending from western Pennsylvania, western Virginia, and western North Carolina to eastern Kansas, and from Michigan and Wisconsin to eastern Texas and central Georgia. Total sales for 1957 were at the rate of nearly $1.7 billion.

The operating organization of the company had been decentralized since 1930. Each of the 25 divisions operated on a virtually autonomous basis within a prescribed geographic area. Although final decision rested with the general office on consolidation of old stores and investment in new ones, each division was expected to take the initiative in seeking out new locations and planning store development programs and then, through the regional vice president, to present to the general office for approval its proposals for capital expenditures. Normally the company expected a return on investment of at least 20 per cent before taxes. The investment in a new store was considered as including store equipment, installation costs, leasehold improvements provided by Kroger, incremental warehouse equipment, store merchandise, and back-up stock in warehouses. For new stores the amounts needed for these various items were usually calculated on the basis of recent experience related to store size and sales volume. In 1957, for a store with sales of $30,000 a week incremental warehouse equipment amounted to about $15,000, and required merchandise inventory at cost was equivalent to about three times weekly sales at

retail. Equipment was depreciated over 12½ years, and leasehold improvements were generally amortized over five years.

Zanesville was the county seat of Muskingum County, a rich agricultural area in east central Ohio. The city was divided into three parts by the Licking and Muskingum Rivers; and accesss from one part to another was hampered by the paucity of bridges and the necessity of going through the congested downtown district in order to go from one section to another. Peripheral roads were practically nonexistent; the few which did exist were narrow, winding, and in poor condition. A new expressway (rerouting U. S. Route 40), scheduled to open in 1975, would bypass the downtown section, relieving traffic congestion there. It would facilitate access from the east sector of Zanesville to the north and south sectors.

Zanesville was considered one of Ohio's better market cities. Population in Muskingum County in 1957 was estimated at around 76,000, including 44,000 in Zanesville. Corresponding figures reported in the 1950 United States Census had been 74,500 in the county and 40,500 in Zanesville. The city was primarily an agricultural trading center. There was no large industrial section within the city, although a few plants were located along the railroad tracks paralleling the northern part of the Muskingum River.

Economic stability had been good in the Zanesville area and was expected to continue so. The residents were approximately 92 per cent native-born whites and 6 per cent Negroes. Retail sales and services and the professions accounted for 46 per cent of the gainfully employed, manufacturing and mining 40 per cent, agriculture 9 per cent, and construction 5 per cent. Typical annual income per family was $4500. Per capita food expenditure per week was $4.60.

Kroger executives estimated the current Zanesville city food sales at $310,000 per week, compared with $295,000 in 1954 according to the U. S. Business Census, and for Muskingum County at $400,000 per week compared with $348,000 in 1954.

The Kroger management had found that, when a second Kroger store was opened in a town with a potential for two Kroger stores, in most cases there was little adverse effect upon the older Kroger store. After a brief setback the older store regained its previous sales level. Thus, sales of the second store were almost entirely new Kroger business. A problem in two-store towns was to decrease the time required to bring the second store up to planned sales and profits.

When the County Fair store had been opened in June, 1956, the effect on the Kroger downtown store had been slight and of short duration. Indeed, the downtown store was currently enjoying satisfactory sales and profits, even though its sales area and parking facilities were considered "tight." A comparison of the trend of sales for selected four-week periods for 1956 and 1957 (Table III) showed that sales in the downtown store were stable while sales at Country Fair were going forward. Kroger executives believed that this comparison indicated that the downtown store had about reached the maximum sales which it could expect with existing store and parking facilities. Expanding these facilities was not possible.

The Kroger Co. had three major competitors in Zanesville; namely, Big Bear, A & P, and Albers, each operating one supermarket. These all had modern facilities and were regarded by Kroger as being well established. Table IV summarizes some comparative data.

TABLE III

THE KROGER CO.: AVERAGE WEEKLY TRANSACTIONS AND SALES IN TWO ZANESVILLE STORES FOR SELECTED FOUR-WEEK PERIODS, 1956 AND 1957

Period	Average weekly number of transactions		Sales	
	Downtown	Country Fair	Downtown	Country Fair
1956: 1st	7,424	.....	$131,000	.....
4th	7,527	.....	141,000	.....
7th	7,504	5,594	131,000	$99,000
10th	7,878	4,074	137,000	85,000
1957: 1st	7,279	3,689	149,000	94,000
4th	7,956	4,948	147,000	102,000
7th	7,981	4,933	145,000	114,000
10th	8,264	5,847	151,000	123,000

Big Bear was located downtown near Kroger. In addition to a regular supermarket operation on the main floor, Big Bear had a nonfood area in the basement, recently renovated at a cost of $100,000 to create a "department store look." A premium redemption center for Big Bear's Buckeye Premium Stamps, formerly in a separate downtown location, had been installed as a section of the nonfood department.

Albers was located in the Country Fair Shopping Center along with Kroger, and was known to be actively seeking a site in the south sector for a second store.

A & P was located on the periphery of the downtown area, a little "off location" but readily accessible to the south sector of Zanesville.

The tract of land for the proposed new shopping center at Maysville Pike and Clay Street was at the very southwest edge of town, on the main traffic artery (U. S. Highway 22) leading through the residential area to the north and the rural areas to the southwest (Figure 1). This site was a mile farther south than the Pierce Street site which Kroger had rejected in 1954, but that site had been taken by a nonfood business and was no longer available. Kroger executives regarded the Maysville location as by far the best site unencumbered by existing buildings which was currently available for a shopping center in the southwest sector of town. Figure 2 presents a plot plan. The total land area of the site was about 575,000 sq. ft. Approximately 152,000 sq. ft. consisted of a hill with a sharp rise in grade.

The promoter intended to "bite" into the hill to gain about an acre of usable land and to use the fill to grade and level the parking area. He knew that the more he bit into the hill, the costlier would be the development, and was aware that in any event he would have a problem in laying out the shopping center to take full advantage of the land. In developing the shopping center to capacity, he expected to provide a 4 to 1 ratio of parking to store area.

The primary trade area of the proposed shopping center included the southwestern part of Zanesville (Wards 5 and 6, south of Muskingum River) and five adjoining townships to the south of Zanesville. The area was one of moderate growth; population had been 29,564 in 1950 and 31,060 in 1957, and was projected to be 33,750 by 1962. Currently there was no major food store in the area. Most of the residents shopped for food downtown and some even in the Country Fair Shopping Center.

TABLE IV

COMPARATIVE DATA ON SUPERMARKETS COMPETING WITH KROGER IN ZANESVILLE, 1957

	Big Bear	A & P	Albers
Year opened	1948	1948	1955
Size	120′ x 150′	100′ x 180′	100′ x 160′
Parking space	130 cars	124 cars	800 cars*
Estimated weekly sales	$55,000**	$25,000	$27,000
Distance to Maysville Pike site	2.7 miles	2.9 miles	6 miles

*Used jointly with other stores in the shopping center.
**Main floor only.

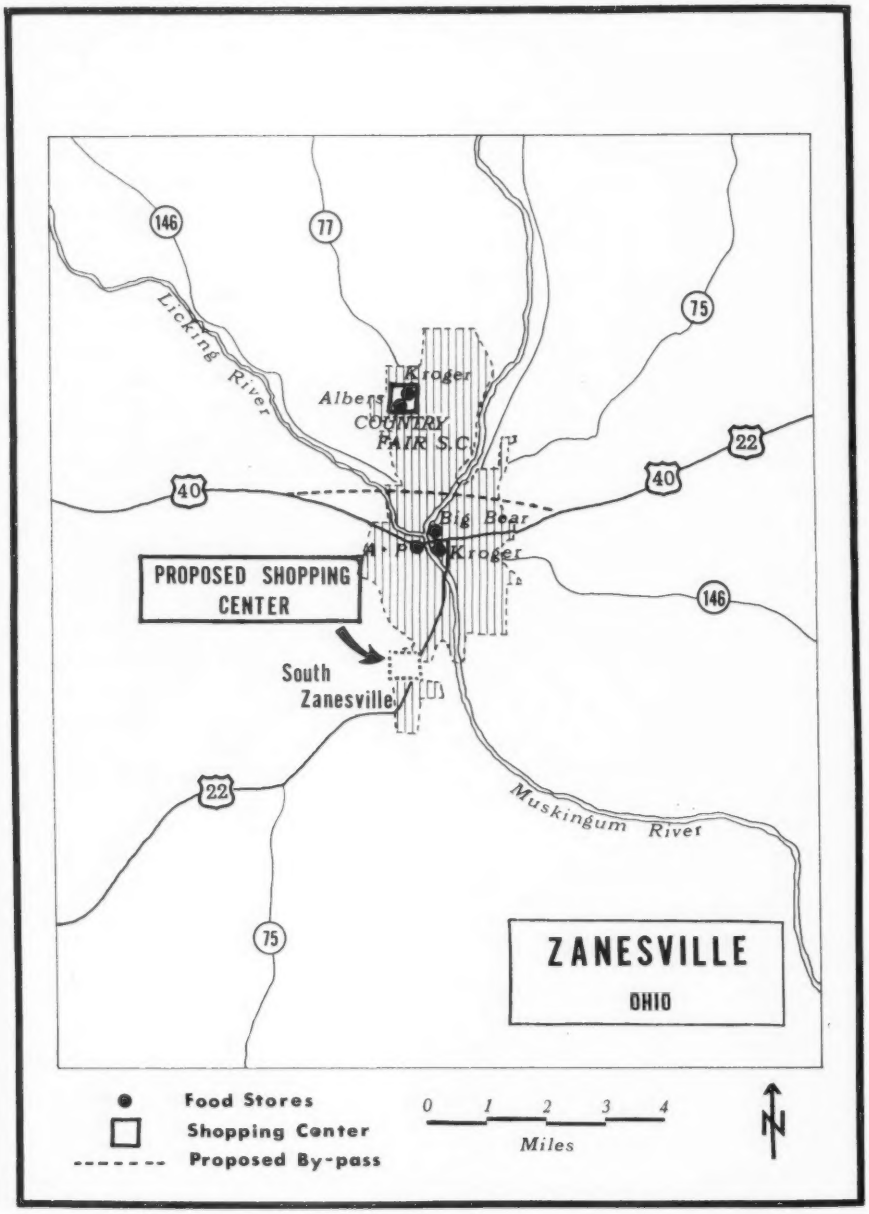

FIG. 1.

North of the proposed site, the trade area was composed of old homes with many multifamily units. South of the site, the homes were single-family, built

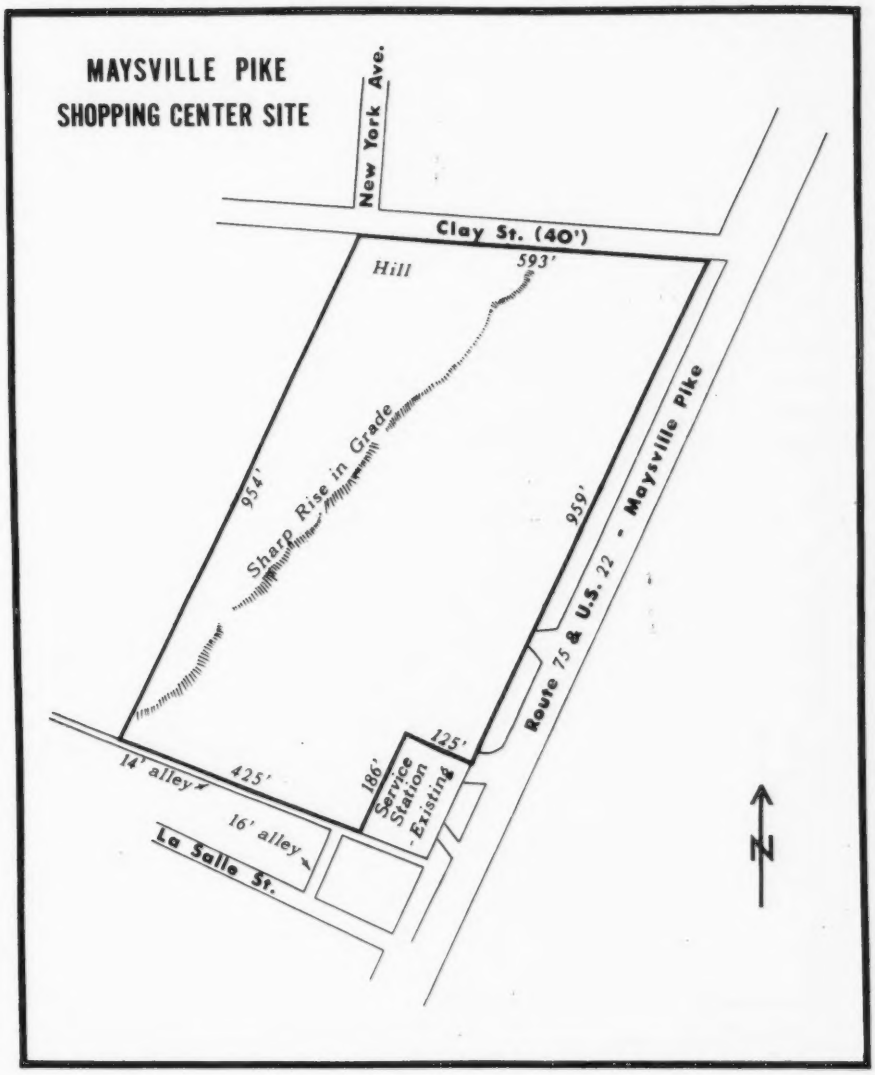

FIG. 2.

since World War II. In general the income of the trading area was low-middle to middle. Although this was one of the two growing areas in Zanesville, its growth was slower than that of the area on the northern periphery of Zanesville.

The promoter proposed to open the shopping center with a supermarket, a drugstore, a hardware store, a dry cleaner, and possibly a shoe store, and to enlarge it later as tenants became available. Although no definite commitments had been made by others, it

was known that Woolworth and Grant were considering the possibilities of the site, but only on condition that there be two supermarkets in the development and a substantial drugstore (7500 sq. ft.). Woolworth would need a store facility of 21,000 sq. ft., and Grant one of 16,500 sq. ft. Montgomery Ward, located in downtown Zanesville, had also expressed an interest in the site. The developer of the Country Fair Shopping Center, however, was known to have been negotiating with Montgomery Ward for over a year without reaching an agreement, presumably because Montgomery Ward was not satisfied with the building site and parking facilities adjacent to it.

Division executives did not feel that Big Bear would be interested in the proposed site or any other in the south sector of Zanesville, because it had just entrenched itself downtown and was still consolidating its position there.

Albers was known to be interested in establishing a supermarket in the southwest area of Zanesville. In fact, the promoter of the Maysville Pike center wanted to build two supermarkets of the same size, one for Albers and one for Kroger. This arrangement was acceptable to Albers, but Kroger executives believed that the center could not support more than one good supermarket. If only one supermarket was to be built, the promoter considered Kroger to be a stronger tenant and preferable to Albers, provided Kroger would match Albers' terms. On an exclusive basis Albers was ready to take a 20,800 sq. ft. store and to sign a 15-year lease at an annual rental of $28,000.

Kroger executives thought that 20,800 sq. ft. was too large an area for the store. They considered 14,000 sq. ft. adequate for the first five years and 16,500 sq. ft. (all on one floor) adequate for the next ten years. Therefore the division real estate manager informed the promoter that Kroger might be interested, on an exclusive basis, in a store of 16,500 sq. ft. without a basement or mezzanine, on a 15-year lease with three 5-year renewal options, at an approximate monthly rental of $1856 or 1 per cent of sales, whichever was higher. For this minimum annual rental of $1.35 per sq. ft. the developer would be expected to provide the store building, including air conditioning, and parking. Kroger's investment in equipment, fixtures, and installation at the proposed site was estimated at $137,000. The proposal to the promoter was tentative, subject to further discussion and final approval by General Office.

Division executives estimated that if a competitor was permitted to go into the proposed new shopping center on an exclusive basis, annual sales at the Kroger downtown store would be reduced to about $1,560,000, with a net profit before taxes of 3.4 per cent, and at the Country Fair store to $1,352,000, with a net profit before taxes of 2.4 per cent.

If the Kroger management decided to go into the proposed new shopping center, the executives realized that the problem would be posed of what to do about the downtown store. If this was closed there would be better spacing between stores and less overlap in trading areas. Some executives believed that the store at Country Fair would benefit materially and that the store in the southwest part of Zanesville would soon be on a profitable basis. Currently, half the downtown store's sales volume was realized from customers living in the east sector of town. It was estimated that 50 per cent of these customers might be lost if the downtown store was closed but that the remaining 50 per cent could be expected to transfer either to

Country Fair or to the new Maysville Pike store.[8] In appraising their existing store facilities, Kroger executives rated the downtown store at best only equal to competitors' stores but adequate for the remainder of the current lease term. The parking facilities they classified as serviceable but inferior to those of competitors. With some further growth of Zanesville's population and the ever-increasing traffic congestion downtown, they believed that the parking facilities would be inadequate after 1961. At that time they would have to face the matter of the two five-year renewal privileges at a rent subject to negotiation. They estimated that by then the existing rental would be too high for the facilities. They believed, however, that the store would probably remain profitable for several years, even if a competitor went into the proposed Maysville shopping center.

Some of the division executives argued that Zanesville needed two Kroger stores to cover it adequately, but that it was not a three-store city. Noting that the trade areas of the two existing Kroger stores overlapped, they were in favor of relocating the downtown store to the southwest of Zanesville. They regarded it as a sound defensive step to open a store at the proposed site and close the downtown store. Such a move would hinder Albers' expansion into the area, would strengthen Kroger's position at Country Fair, and would give Kroger a modern store with facilities and parking area adequate for the future which probably would be a part of a successful shopping center.

If the downtown store were closed and a new store established at the proposed site, probable sales and profits at Country Fair and at Maysville for the first year were estimated as follows:

Country Fair store	
Current weekly sales	$29,425
Estimated transfer of sales from south sector to new store—20%	5,885
	$23,540
Estimated transfer of sales from downtown store when closed:	
From north sector—10%	3,655
From east sector—12.5%	4,570
Conservative estimate of "growth" sales	3,235
Sales projection	$35,000
Net profit projection	3.2%
Proposed Maysville Pike store	
Estimated transfer of sales from downtown store when closed:	
From south sector—40%	$14,620
From east sector—12.5%	4,570
Estimated transfer of sales from Country Fair store:	
From south sector—20%	5,885
Estimated new business	12,425
Sales projection	$37,500
Net profit projection	3%

It was further estimated that by the third year the new store would have a weekly sales volume of $40,000, and by the fifth year $42,500.

The manager of the real estate department at General Office, when consulted informally, suggested that the store development program in Zanesville might be approached by opening a store in the south with limited fixturing[9] (at a saving of $1800 per year) and continuing to operate both existing stores until reasonable experience indicated that the downtown store should be closed. He pointed out that this approach deserved consideration, especially since the company would still have a $42,700 lease obligation on the downtown store and since the unique three-sector division of Zanesville by the rivers presented possibilities for three Kroger stores in a town that normally would support only two stores. In his opinion, based on a customer spotting

[8] Kroger had the right, without the landlord's permission, to sublease the downtown location to whatever tenant it wished and thus could prevent another food store from opening at the downtown location. A local chain hardware store had indicated interest in this location.

[9] I.e., fixturing scaled to needs for the immediate future but not providing for possible later expansion.

map, the downtown store could reasonably be expected to continue to operate at 60 per cent of the existing sales rate in the face of a new Kroger store in the southwest.

If Kroger chose to adopt this suggestion, the Columbus division estimated that annual sales at the downtown store would be $1,144,000, with a net profit before taxes of 2.5 per cent; at Country Fair, $1,352,000, with a profit of 2.4 per cent; and at the proposed new store, $1,560,000, with a profit of 3.4 per cent before taxes.

In drafting his recommendations the division real estate manager gave careful consideration to the strengths of the downtown store. It was a successful store. Kroger's experience had been that in towns the size of Zanesville a store in the core area with adequate facilities usually proved successful.

LAND, FOOD, AND POPULATION IN THE KINGDOM OF TONGA

T. F. Kennedy

Mr. Kennedy, Lecturer in Geography at Ardmore Teachers College, Auckland, spent three years in Tonga carrying on research in geography and agriculture while in the Education Department. His "Village Settlement in Tonga" appeared in the October, 1958, issue of the "New Zealand Geographer."

TONGA, because of its small size and relative uniformity of soil, climate, racial type, and farming methods, affords a compact unit for a study of population related to resources. Further, and of real importance in attempting to assess future possibilities, the form of Government[1]—a respected Royal House and a parliament with a large majority of nobility[2]—is able very closely to determine land holding and to distribute land as it considers best. The implication is that soil resources can, if necessary, be fully utilized on a basis fair to all individuals and to the greatest good for them and the state. The land policy is not by any means a communal one but recognizes the right of each individual to his own farm, leased from the crown or nobles, although the size is the same for each and is determined by law.

The unknown quantity in a land with a Government of this kind is its reaction to economic want. There is little likelihood of nobility voluntarily accepting circumstances which would diminish their margin of wealth. At the same time this does not necessarily invalidate the possibility of the land being used to full productive capacity. It does, however, introduce a variable factor into the assessment of the total land area ultimately available for individual farms. Statistics show that relative to population there is still ample land available to feed at least double the present 62,000,[3] but much of this land is on new islands, to which people are disinclined to go. By law, males over 16 years may apply for an allotment of 8¼ acres of land.[4] Many are now offered a plot on other than their home island; rather than leave they refuse the allotment and live with their relations, who, by custom, are obliged to support them. Attachment to the home island has been forcibly demonstrated recently by the people of Niuafo'ou[5] who in 1947 were evacuated

[1] Tonga is a self-governing kingdom. It is a British Protected State by virtue of a Treaty of Friendship ratified in 1901, replaced by a new treaty in 1958. The United Kingdom is represented by the British Commissioner and Consul who has certain advisory functions. Apart from this, the Kingdom is independent, the present ruler being H.M. Queen Salote Tupou.

[2] Nobles have a majority of two to one over people's representatives.

[3] Based on an annual increase of 3.1 per cent on the 1956 census of 56,838.

[4] A piece of land 100 fathoms by 100 fathoms. It may be land owned by the crown (which ultimately owns all land) or on the estate of a noble. Europeans and other aliens may not buy land in Tonga and the few leases which have been granted to such people have now almost expired and will probably not be renewed.

[5] Niuafo'ou or Tin Can Island is well known for the swimming mailmen who used to swim out to collect mail dropped overboard in sealed tin cans from mail steamers.

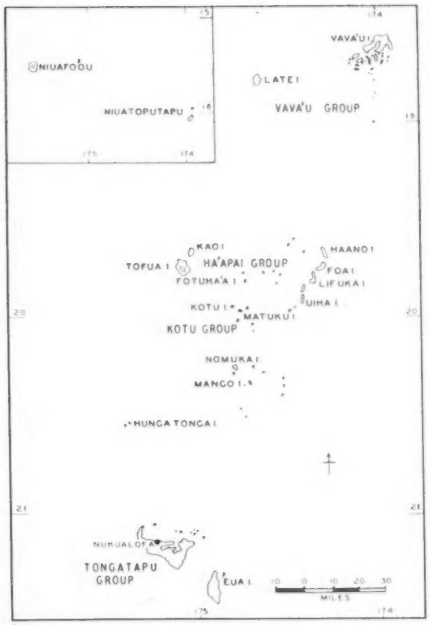

FIG. 1. Location map of Kingdom of Tonga.

to 'Eua and Tongatapu (Fig. 1) after a volcanic eruption. Now, 12 years later, the Government has given permission for those who wish to return, to do so. Many are preparing to return to the comparative insecurity of their fiery island. Disinclination of people to settle in new areas underlies the basic problem which Tonga will have to meet in the not-so-distant future—the problem of supporting her rapidly growing population.

Until quite recently Tonga has had no immediate land and population problem. Early European contact had much the same decimating effect on population as in other parts of the Pacific and the estimated 18,000 inhabitants in 1850[6] had increased to only 23,000 by 1920. Since then there has been a steady increase to 34,130 in 1939 and a more rapid increase to 56,838 in 1956[7] (Fig. 2).

During and since the Second World War several factors, linked with increased national and individual prosperity from high prices for copra exports, have combined to cause the sharp increase in population which has doubled in the last 20 years. These factors are: the sending of more Tongans to the Central Medical School in Fiji for training; better and more widespread health services, including free medicine and hospitalization, district nurses concerned with infant welfare, and wider education among the people in European medical methods; provision of large concrete rain water tanks in all villages thus reducing the use of contaminated well water for drinking; and improvement in housing with better ventilation and wooden floors above the ground. The general effects of these measures are seen in Tables I and II.

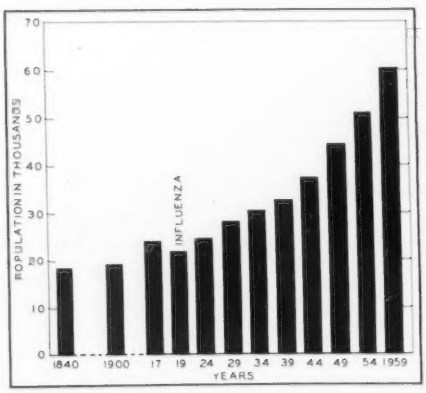

FIG. 2. Growth of population of Kingdom of Tonga. (Data from official Government estimates and censuses.)

[6] Missionaries' estimate.

[7] These years have been chosen as they are the years in which full and accurate censuses have been taken. Population figures for other years are based on estimates by the Registrar of births and deaths and although useful may not be accurate. Earlier censuses (1911, 1921) are similarly open to question. The census of 1956 was directed by a trained statistician whose enumerators were mostly school teachers of reasonable educational standard and who underwent a period of training.

TABLE I

TRENDS IN BIRTH, DEATH, AND INFANT MORTALITY RATES

	1920's	*1950's*
Birth rate per 1000	37	39
Death rate per 1000	17	9
Infant mortality (per 1000 births)	110	57

The situation, by no means peculiar to Tonga, of a social group, whose answer to high rates of infant mortality and premature death in adults is to develop habits favorable to a high birth rate, being exposed quite suddenly to modern health measures, naturally results in a leap in population growth. The medical results are relatively rapid. The social habit changes slowly—much too slowly to compensate for the sudden increased longevity and child survival rate. Planned restriction of family size to a large extent depends on education which, in the Kingdom, is advancing at a reasonable rate. Tonga, because of its autocratic political and social organization, may well be better placed than most countries to introduce controlled family size if this were deemed necessary or desirable.

TABLE II

TRENDS IN POPULATION AND RATE OF INCREASE

Year	*Total population*	*Average annual rate of increase (%)*
1901	20,700	....
1911	23,017	1.07
1921	24,937	.80
1931	28,839	1.46
1939	34,130	2.12
1956	56,838	3.1

Rate of increase, except 1939–1956, from United Nations Demographic Yearbook. The figures for total population include Europeans who are non-permanent, whose numbers have declined from about 400 before the Second World War to about 200 since, and who do not significantly affect the calculations. The low average rate of increase from 1911 to 1921 reflects the influenza epidemic of 1918–1919 when an estimated 1000 persons died.

Because of the rather involved family system it is not easy to assess average family size although the average number of people living in one house may be taken as a guide. This gives an average family as 6.47.

The quite remarkable recent increase in population must give cause for concern in terms of the capacity of the Kingdom to accommodate its people in the next half century. A consideration of resources, population density, and distribution should serve to demonstrate the very real problem.

RESOURCES

The Kingdom of Tonga consists of about 150 islands scattered over 20,000 square miles of the Pacific Ocean. The total land area, however, is only 269 square miles (including lakes) and only 36 of the islands (including Niuafo'ou) are permanently inhabited. The other islands are either too small, too inaccessible, or too volcanic to be occupied under present conditions.

The inhabited islands contain 132,000 acres, of which, after allowing for urban and village sites and roads, approximately 125,000 acres can be farmed. Farming, however, is not confined to the inhabited islands. Estate owners or lessees of land additional to their statutory allotment visit the uninhibited islands periodically for purposes of gardening or copra gathering. Islands in this category vary greatly in size—from four or five acres (smaller islands exist but are virtually only sand bars on the reef and are quite unsuitable for farming), to 200 acres, with, in the extreme, the volcanic islands of Tofua (13,750 acres including lakes) and Niuafo'ou (12,422 acres including lakes). This last island previously had a population of 1500 people living in nine villages but has been uninhabited, except for a few score copra cutters employed by the Queen and nobles who

own the estates, since evacuation in 1947.

The total area of the group is 173,041 acres. Of this some 17,000 acres is taken up with water surfaces, land too rugged for cultivation, immature lava flows, roads, and town and village areas. With the growing population, settlement on undeveloped islands will require roads, cart tracks, and village sites and existing villages will spread onto new land. A doubled population presumably will double the number of house sites. Existing village sites could well be built on further, without increasing the land taken, if house site areas were reduced from the present two-fifths of an acre. This is unlikely, at least until extreme pressure on the land becomes evident. In view of this, a maximum of about 150,000 acres of cultivable land will be available for ultimate farm production in the Kingdom.

In 1862, King George Tupou I was instrumental in introducing legislation emancipating Tongans from the power of their chiefs and providing that every man over 16 years of age could, on application, be allotted 8¼ acres of land, together with a town or village house site of two-fifths of an acre. This has been largely adhered to since. On this basis there is room for approximately 18,000 farms. If we assume that the average family size of 6.47 will still apply to all landholders, the population maximum under these ideal conditions would be in the order of 117,000 people. Only 4 per cent of the people are not directly dependent on agriculture and most of these have an allotment for part-time food production. However, many landholders would be unmarried, many newly married, and it is not to be supposed that the Royal Family and nobles will be content with 8¼ acres since much of their private revenue comes from copra on their fairly large estates. The potential population capacity would, on this basis, be rather less than 117,000. At present rates of increase this total is likely to be reached by about 1980. Such a Malthusian prospect demands fairly swift measures to be adopted in the way of planning.

Currently, a cadastral survey is being carried out with the object of defining land boundaries and ending arguments by estate owners, some of whom will not yet allow subdivision of quite large tracts of land at present lying fairly idle. But, by the time this is complete and apis[8] allotted, the pressure of population on the land is going to be evident, at least on the inhabited islands.

Population density is uneven over the main islands of the group. In Ha'apai the density is over 400 per square mile (417 according to the 1956 census) allowing rather less than 1½ acres per person. The obvious answer to this is to encourage people to settle land on unoccupied islands and to redistribute apis on these islands to settlers so that they may be fully utilized by resident lessees. But there are considerable difficulties, primarily personal rather than physical. People are very loath to leave their home island and would rather accept a lower standard of living than do so. This is accentuated by the fact that a number of the unoccupied islands have poor landings and consequently would be isolated from the more civilized centers. The absence of water, although important, could be overcome by rain tanks as there is normally abundant rainfall.

The physical bases of agriculture and to some extent land holding vary throughout the islands. The practice of agriculture varies little except in so far as it is related to the above. For a consideration of future prospects with

[8] The "api" is the allotment.

regard to land and population it is necessary to examine these factors.

AGRICULTURAL METHODS

Tongans are village dwellers and a man's api may be close to the village or some distance from it. He visits his api on perhaps four days a week, which is usually adequate to provide food for himself and family and to produce export crops, which are exclusively copra, bananas, and pineapples. Farms are unfenced and about half a typical farm consists of an unkempt area in permanent coconuts,[9] the remainder having a number of small plots cleared from bush and weeds. Roughly one-third is cultivated, the rest being in "bush fallow." Land out of bush fallow is planted with yams (a favorite and a prestige food) interplanted with giant taro or with bananas, and with the paper mulberry for making bark cloth. Taro is raised in less fertile soil or swampy areas. Sweet potatoes also occupy less fertile soil as does cassava or manioc. Bananas and the paper mulberry are left in the same ground for three years but the food crops are shifted annually. Scattered among the main crops are corn, pineapples, pawpaw, breadfruit, mango and citrus trees, kava, and possibly tobacco, peanuts, or European vegetables. Somewhere in the api, sugar cane, pandanus for mats, and various trees and shrubs yielding scents and dyes are to be found. To clear "bush fallow" land, the farmer cuts down the woody growth in the dry season and burns it when dry. The ground is then worked with a hoe only in the places where plants are to be set. Yams, interplanted with giant taro or with bananas, are normally the first crop. The next crop is usually sweet potato or taro, followed by cassava or bush fallow (Fig. 3). The fallow may last from one to four years depending on the size of the api.

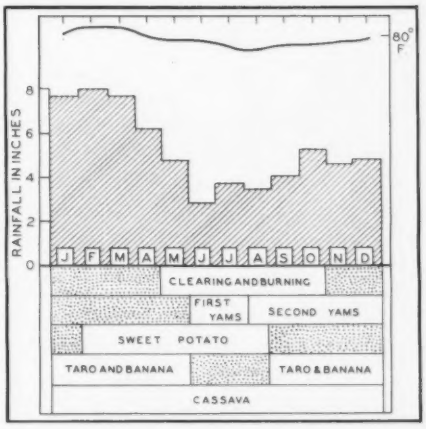

FIG. 3. Average monthly temperature and rainfall (Ha'apai), and planting periods of main crops. (Meteorological data supplied by New Zealand Meteorological Office.)

Crop yields, especially of coconuts and fruit, are diminished by haphazard selection of planting materials and by pests and diseases. Rats, which climb the palms and gnaw open young nuts, are responsible for a 20 per cent loss in coconut yield. The Rhinoceros Beetle (Oryctes rhinoceros), so far fortunately confined to Vava'u, causes great damage to coconut palms. Bananas are widely attacked by the Scab Moth (Nacoleia octasema) which destroys roughly 30 per cent of the fruit. The only one of these major pests against which active control measures are taken is the Rhinoceros Beetle and this only because of strict Government enforcement.

THE PHYSICAL BASES OF FARMING

Climate and soils are generally very favorable to agriculture. Nowhere do climatic factors restrict cultivation by traditional simple methods. Rainfall,

[9] By law at least four acres must be properly planted in coconuts.

although varying throughout the group,[10] is everywhere adequate in amount for plant growth. However, there is a certain seasonality. A "rainy season" occurs from January to May and a "drier season" from June to December. Adaptation to this regime provides the cropping program (Fig 3). September to February is a somewhat unreliable period in terms of rainfall; occasionally severe droughts during this period seriously reduce crop yields but do not create food shortages under the present population numbers and api sizes. Absence of lakes or streams makes irrigation of any kind impossible during these periods.

Minimum temperatures range quite significantly from 64° F. in Niuatoputapu to 51° F. in Tongatapu. Mean daily minimum temperatures during the winter months are 4° F. lower in Tongatapu than in Vava'u and though not affecting the growth of staple root crops do have an adverse effect on year round banana production, a situation reflected in banana export figures. Vava'u has winter month exports which are two-thirds those of the summer months. Tongatapu's winter month exports are only one-quarter those of the summer months.

The year round potential per acre for food production in the southern islands, Tongatapu and 'Eua—which together make up half the area of the whole group—is somewhat less than that for the more northerly islands, on this account, as bananas are an important food crop in addition to providing export income.

The bulk of population at the present time live on the islands of the eastern, coralline chain (Fig. 1) but these are sufficiently close to the volcanic chain to have received coatings of volcanic ash of varying thickness, thus having soils of higher fertility than is common on coral islands. Throughout the entire group then, volcanic materials are an important element in soil composition, but are naturally more dominant on the volcanic islands themselves, which are at present least used. Very fertile when first used after long bush fallow, the soils of the limestone islands rapidly deteriorate with cropping, due to a deficiency of nitrates and fairly rapid leaching. They are, however, rich in available phosphates and potash.[11]

The key to maintenance of soil fertility under existing cultivation methods is an adequate "bush fallow." It was stated earlier that api sizes were ideally 8¼ acres. Due to personal wishes, local population pressure, private leases, and existing survey boundaries, there is some variation from this ideal size. The repercussions these variations have can be considered on the main islands. They provide some preview of future difficulties in supporting increased numbers of people.

Tongatapu, the largest island (63,516 acres) and the seat of Government, is flat surfaced but slightly tilted from northwest to southeast and with the exception of narrow swampy lagoon margins is all well suited to agriculture. The over-all population density is 309 per square mile (1956 census) allowing a little over two acres per person. The density is rather exaggerated as there are usually quite large numbers of tem-

[10] Average annual rainfall: Niuatoputapu 90.8", Vava'u 76.5", Ha'apai 63.7", Tongatapu 63.4" (N.Z. Meteorological Office). These figures are based on returns made by Tongan recorders at the stations concerned to the N.Z. Meteorological Office, and represent readings over the last 9 to 13 years only. As far as is known they are fairly correct. Earlier records exist, which are not substantially different except for Niuatoputapu which over a longer period shows evidence of being up to 10" higher.

[11] Soil analysis by Canterbury Agricultural College, Lincoln, New Zealand.

porary residents from other islands—secondary school pupils attending the main government and church boarding schools; members of parliament and their families; relatives who are attracted by the more metropolitan atmosphere of Nukualofa, the capital (9000); and people concerned with attending on the Royal Family. As the center of Government administration and of commerce, this island contains the major proportion of workers concerned with these activities.

Although throughout the Kingdom 96 per cent of the people are directly dependent on agriculture, in Tongatapu this is reduced to 88 per cent due to the foregoing reasons.

The actual size of land holdings has great variation, from as little as two acres up to 600 acres, with an average size of 12 acres. The larger holdings are held either by chiefs or the crown, and in some cases are extra land leased by a taxpayer. In theory, these large holdings are potential future allotments of 8¼ acres. The great majority of individual land holdings are of the statutory 8¼ acre size having about half in coconuts and one quarter to one-third used for food crops each year. This allows a bush fallow of at least two to four years for restoring soil fertility, a rotation which appears adequate on the dark silt loams, a foot of which overlies deeper clay ranging in depth from three feet in the northwestern portion of the island to at least 40 feet on the eastern higher part.

The low coral islands of Ha'apai, while supporting the greatest pressure of population (417 per square mile, 1956 census) with 99 per cent of this population directly dependent on agriculture, have soils less fertile than those of Tongatapu. Windblown volcanic clays are mixed with sand, one or other constituent predominating in different localities. The islands are flat and the whole area suitable to agriculture. There is a marked difference from Tongatapu in the vegetation of weeds and undergrowth in the apis, which expresses the impoverished condition of the soil. Weeds like Indigofera and Leucaena, predominant in Tongatapu, give place here to Triumfetta and Lantana. Guava does not show the prolific growth often regarded as an indicator of soil fertility on abandoned areas.

The most important factor influencing weed-growth is the system of land use and the rotation of crops. Owing to the high density of population in Ha'apai, adherence to the constitutional 8¼ acres has not been possible. Scarcity of land has now resulted in all available apis, large as well as small, being planted with coconut palms. The same rotation of crops practiced in Tongatapu is followed, but the crops are all planted under and between the palms. Moreover, the period of fallow or regeneration is much shorter as the owners of the smaller apis cannot afford to rest their land. An owner of a four-acre api will have planted the area completely with coconuts, and will then use one quarter for yams, a quarter for sweet potatoes, and a quarter for cassava each year, leaving a fallow period of only one year. More cassava and less yam and taro are grown than in Tongatapu, a further indication of lower fertility as cassava is the least demanding of these crops. Undoubtedly, the existing system of land use and farming methods will ultimately lead to impoverishment of the soils and of the economy of Ha'apai.

Vava'u, two-thirds of which is a hilly, raised coral island, the remainder small islands, is the most fertile of the coral islands in the Kingdom having received a thick mantle of volcanic dust. Population density (250 per square mile, 1956

census) is rather lower than on the other groups but although soil potential is greater than in Tongatapu, the occurrence of hill slopes reduces intensity of land use on account of soil erosion problems if these slopes are fully cleared for cropping. Even now with partial clearing, incomplete cultivation, and trash, heavy rains cause soil wash, rills are common on cultivated slopes, and gullies frequent in cleared village areas. Little primary forest remains, as most land has been used at some time, but the steeper slopes and hill tops are clothed in secondary forest. Although potential apis, the allocation and use of these slopes requires different criteria if they are to be profitably farmed.

Vava'u has analogies with Ha'apai in that a very high proportion (98 per cent) of the people are directly dependent on agriculture; apis are fully planted with coconuts and have over a third planted in food crops, but the inherent soil fertility is capable of sustaining this cropping concentration.

Breadfruit has greater importance as a food crop than in Tongatapu because it flourishes under slightly higher temperatures. On a communal basis the steeper slopes could well be devoted to such tree crops which, with coconut palms, would minimize the soil erosion problem.

Two islands, Niuatoputapu and Niuafo'ou, lying 167 miles north and 211 miles northwest respectively of Vava'u, are well away from steamer routes. This remoteness has an adverse effect on their development. The 2000 inhabitants of Nuiatoputapu, all of whom depend on agriculture, are at present able to select the more fertile areas for their apis. Soil differences are greater here than on other islands. They range through sandy coastal soils used chiefly for coconuts; emerged lagoon soils supporting root crops; well drained fertile sandy soils with a clay topsoil eroded from near-by hill slopes and situated at the base of the slopes of the central hill (350 feet); to clay soils either resting on clay, rock pebbles, or bedrock and covering the hill slopes. These last are used for cassava and banana though occasionally for other root crops and for peanuts. Much of the slope land is still in forest, in places intermixed with coconuts. Like the slope land in Vava'u, full use will be dependent on soil conservation by contour strip cropping or terracing and the allocation of the land to people aware of these requirements, and trained in these conservation methods. Including the near-by island of Tafahi, separated by only a narrow strait, population density (236 per square mile, 1956 census) is rather more than on Vava'u, and its potential per acre is equivalent.

Niuafo'ou is one of the problem islands. Volcanic activity is spasmodic (1853, 1867, 1886, 1912, 1929, 1935, 1936, 1947) and destructive. Decision as to permission to settle is a difficult Government responsibility as infrequent shipping and an open roadstead allow little chance for swift evacuations should a serious eruption occur. Many of the 1947 evacuees have now been allowed to return to resume farming on an island littered with fallen coconuts and overrun with wild pigs. After 12 years' enforced fallow the coarse sandy soils surrounding the central volcano will well repay cultivation although their water holding capacities are low and short dry periods can be serious. Slope land presents similar problems to that in Niuatoputapu and almost 2000 acres of lava flows are unsuitable for cultivation until they have matured. Any kind of concentrated future settlement on Niuafo'ou would appear to be dependent on the provision of a seismological station.

Both Niuafo'ou and Niuatoputapu lie in the hurricane belt, a fact which further reduces their ability to satisfactorily support ultimate populations comparable with the more southerly islands.

If Tongans are prepared to live on Niuafo'ou, and it is quite obvious that they are, then the other volcanic islands of the Kingdom present distinctly better possibilities. Most important of these are Late in the Vava'u group and Tofua and Kao in Ha'apai.

Late (6.7 square miles) has been uninhabited since it last erupted in 1854. Fertile, forest clad, and with considerable land of gentle slope, colonization presents no great difficulty.

Tofua, near which Captain Bligh and his loyal sailors were cast adrift from the Bounty, is a large island (21.4 square miles) which, although poorly served with landing places and having a steaming crater lake of over three square miles, has land of relatively easy slope especially on the northern side. Rich volcanic soils are capable of supporting several thousand people. Near-by Kao is a perfectly conical extinct volcano, fertile, but with much steeper slopes than Tofua. On this account settlement is less practicable. On both islands, under wise management, crop production is quite possible. At present, although not lived on, parts are used for gardening by people from the thickly populated near-by low islands of Fotuha'a, Matuku, and Kotu.

Easily the most favorable island for future development is 'Eua, a raised coral structure lying 10 miles southeast of Tongatapu. Its 1300 inhabitants use only a fraction of the cultivable 19,000 acres. The chief disadvantages, as on the volcanic islands, are lack of running water, the difficulty of obtaining water from wells, the poor harbor facilities, and absence of internal roads. Government provision of rain tanks in conjunction with iron roofing for houses can provide water; and roads must be built to pioneer this fertile and as yet virtually untouched island. Conservation practices are essential if complete development, including hill slopes, is to be achieved. The eastern ridge portion is dissected by steep ravines, at present in forest and with little prospect for future cultivation. About half the total area of 'Eua contains good millable forest timber (Alphitonia—Rhus, Callophylum and Erythrospermum), being cut on a planned, long-term basis. A permanent forestry program, while of great value to Tonga which at present imports two-thirds of its banana cases and most timber for other purposes, would restrict full farm settlement on 'Eua. A comparative assessment of the value of land for forestry or food will have to be made when population increase brings pressure on policy. In any event five or six thousand acres of 'Eua are better suited to trees than to farms.

FUTURE PROSPECTS

Except on the low islands of Ha'apai there is good land available to absorb increases in population. However, estimates of available land are considered to be extremely optimistic, since, on account of possible volcanic activity, Tofua and Niuafo'ou, the two largest settlement prospects, are by no means certain of successful colonization. On a purely arbitrary basis, if all available land were to be farmed in 8¼-acre blocks, by average families, 18,000 farms would support 117,000 people, and the ideals of Tupou I would be achieved. It has been shown earlier that in Ha'apai, especially, smaller apis than the usual can support a family but not maintain soil fertility. It has been

suggested[12] that the standard api could feed 12 people, or, alternatively, that apis of four acres are capable of sustaining an average family. This might be possible with irrigation. No research has been done on the capacity of underground water resources, but there are strong possibilities that extensive use would result in increased salinity and the cost of pumping would be high.

Arbitrarily, then, the subsistence potential of the Kingdom would be approximately 216,000. However, nobles are likely to retain larger areas, so this figure is optimistic, but will be reached before the year 2000 if present trends continue unchecked. If this situation arose it could only do so with considerable modification of existing farming methods and social life, and with an acceptance by Tongans of a much lower standard of living. The present four days of work may be insufficient to intensively cultivate the smaller api, when greater care would be needed to obtain the best possible crop yields, to protect crops from pests and diseases, and to conserve soil fertility. Tongans have not the capacity for intensive regular work although this is largely due to lack of past economic want. From this point on, increasing population and declining production seems inevitable.

Large increases in food crop production in apis must adversely affect production of export crops, especially bananas and pineapples, and to a lesser extent, copra. There is room for large increases in copra production by planting new areas and especially by improving the quality of palms in existing areas. Few existing palms have been grown from nuts from selected, high-producing trees, and there is tremendous scope here for improvement by a far-seeing Government and Copra Board. A further problem is that between 60 and 70 per cent of existing palms are over 30 years old (20 per cent are over 50 years and only 10 per cent under 15 years). Thus, unless a comprehensive new planting scheme is begun immediately, there will be a marked decline in production beginning about 10 years from now. Copra production is vital, both from a short term and long term point of view. Tonga relies almost entirely on copra for income with which to pay for imports, and to finance administration and public services. In the short term this income is necessary for development works, for improvement in education and health services, and for agricultural research, education, and development; in the long term, for maintaining the standards attained and to import vital foodstuffs if the need arises. Unfortunately, copra prices, now high, tend to fluctuate widely and any substantial drop would react disastrously on Tongan economy.

Diversification seems essential. Coffee, rice, corn, hemp, ginger, peanuts, and vanilla have been successfully grown and acreages of these crops could well be expanded, but parallel with improvement in coconuts, which, even if unsalable, are a valuable source of food.

Economic activities other than agriculture are limited. So far as is known, minerals are absent. There are small but inaccessible guano deposits on Ata and Hunga, and timber resources when fully utilized are only sufficient for local needs. Tourism could well be developed, but the main islands lack good sandy beaches and hotel accommodations and have none of the more civilized entertainments which tourists demand. Remoteness from steamer routes is an added drawback.

Handicraft industries of the cottage

[12] Report of Director of Agriculture to Tongan Government, 1951.

type are capable of expansion. Mats and tapa cloth have found a ready sale overseas in spite of inefficient marketing arrangements, but there is little prospect of these contributing to the country's economy on a large scale. Apart from any revenue they might derive, social benefits from such occupational interests could prove valuable. Tongan women are quick and nimble at sewing and could be good machinists. A clothing industry based on imported fabrics and local female labor could produce garments cheaply for export but might be handicapped by the inability to achieve the high standard of finishing and inspection required for an overseas market, and by the Tongans' dislike of regular work.

The sea, 20,000 square miles of Pacific Ocean, is a relatively unexploited resource and may well prove very important as a source of food and revenue. Recent collaboration with the Japanese has shown that tuna can be caught in large quantities if the proper equipment and methods are used. The Government has recently employed a Japanese to train fishermen, and new boats and equipment are being obtained from Japan. Plans are afoot for catching other varieties of fish to supply not only local demands but also those of Samoa and Fiji. The success of these will depend on inducing Fijians and Samoans to buy frozen fish which they do not, at present, relish. There is an insatiable demand for protein foods and high prices can be realized for them.

The craving for protein is satisfied by fish, occasional pork on feast days, and tinned meat; and seasonally by whale meat. Migrating south with their young, large numbers of whales pass through Tongan waters and have been caught by hand harpooning from whaleboats since 1910. The number of whales taken in this way is only a fraction of the whales available and the catch is sold for meat, no other products being exploited. Recent surveys have assured the Government that a full scale whaling industry is justified and preliminary plans are underway.

Apart from the soil, the sea, and her people, Tonga has no resources on which to base industry, and must rely on a wise and far-seeing agrarian policy to solve the population problem which is rapidly overtaking her.

CONTROVERSIAL VIEWS ON THE GEOGRAPHY OF NUTRITION

George Blyn

Mr. Blyn is Assistant Professor of Economic Geography at Villanova University.

THIS article deals with certain of the views expressed in J. De Castro's *Geography of Hunger*, 1952; M. K. Bennett's *The World's Food*, 1954; and the FAO *Second World Food Survey*, 1952.

The effects of nutrition, or food intake, on the body may be divided between two aspects, its energy-yielding aspect, as measured by calories, and its health-protecting aspects, such as measured by vitamins and minerals. When the former aspect is deficient the condition may be called undernourishment; when the latter aspect is deficient the appropriate term is malnourishment. In place of such drab terms the emotion-quickening term, hunger, which combines, or confuses, both undernourishment and malnourishment, has come to be used in some recent literature in this field.

Thus when De Castro speaks of the geography of hunger he is not always, in fact he is not usually, referring to starvation in the sense of people with empty bellies. If he were, then perhaps his self-avowed revolutionary boldness, ranking himself with Freud, in bringing taboos out in the open, would be deserved. What De Castro calls hunger may in fact either be undernourishment, inadequate intake of calories, or malnourishment, which may be the absence of any of about forty food constituents needed to maintain health. Others connected with FAO, as is De Castro, also use the term hunger in this manner.

Bennett on the other hand reserves the use of the term hunger for the sensation which most people associate with it, and defines it, as it had been used in the League of Nations, as a condition in which calorie food intake is less than that required to maintain normal body weight when activity is normal. This is a critical concept which would appear to merit a distinct term to describe it, whether it be undernourishment or hunger.

The consequences of deficient levels of nutritional intake are far-reaching in their implications. Here De Castro's interpretations are at least interesting for their suggestiveness. It would seem, however, that at least some of the broad claims he makes for social consequences of dietary deficiencies are inextricably bound up with a variety of other forces so that proof may not be possible. Is malnourishment really the reason why the starving Latin-American allows his fields to be idle while he goes hungry? Is sex-play really the national sport of India, and is it because hunger-induced lack of energy, and scanty resources, have left them no alternative? Is the Chinese peasant hungry because he lacks the energy to make his fields more productive, rather than because of overpopulation?

Other supposedly significant aspects

of hunger may be questioned, as has Bennett. The latter scoffs at De Castro's view that size of human body is a function of quantity and quality of diet rather than of genetics and race. De Castro says Chinese are small because they have been starved for past ages; Bennett says that it may simply be because they are a given variety of man, and the latter vary in size just as, for instance, the various kinds of dogs. Moreover, Bennett suggests, the interpretation of the statistical correlation between diet and size might well be the opposite of what De Castro claims. Bigger size, genetically caused, may have brought about the better and bigger diet of the larger peoples.

Of great importance is De Castro's claim concerning the connection between population growth and malnourishment. His view completely reverses the Malthusian concept. Population pressure does not cause hunger, but rather it is hunger that causes population pressure. This is explained by fertility allegedly varying inversely with protein intake. According to De Castro this is proved by animal experiments, although these do not seem to necessarily support his conclusion, and by a statistical correlation of 14 countries showing perfect inverse order of rank in birth rates and protein intake. Statistical correlation at best "proves" nothing with respect to cause. These statistics are, moreover, hardly at best. The number of countries is quite narrow. Fecundity would probably be a more meaningful measure than fertility. Neither the reliability of the statistics, and their range of error, nor the possible other causes for the ranking are considered.

The significance of hunger appears to depend on what is meant by hunger. Most of the world is said to be hungry. If this is a hunger of empty bellies, deficient calories, then the prospects are frightening in terms of potential political and military consequences. It would seem that the power given to FAO and such organizations would have to be drastically increased. This state of hunger is said to exist according to Boyd-Orr and FAO. But if the world's hunger is not one of empty bellies, but rather one of improperly balanced diets, then the urgency is of quite a different order.

What then is the geography of hunger? According to the FAO Second World Food Survey, all of Africa, Asia, and Latin America (outside the Plata countries) have deficient caloric intake. This is about two-thirds of world population. If, as Bennett insists, caloric deficiency must mean emaciation, then incredulity is not surprising concerning this vast claim of hunger. Bennett argues that the FAO underestimates caloric intake and overestimates caloric requirements in underdeveloped areas. When allowance is made for differences in body size and activity, and accurate account is taken of age and sex distribution, as well as climate, Bennett believes that the data would show intake at least equalling requirements. Sporadic deficiencies do occur but these are irregular in time and space.

Whether there is a geography of hunger in the sense of caloric deficiency may be disputed. But there is no disagreement that a geography of malnourishment certainly exists. This is the geography that De Castro describes. To describe this geography, however, requires more than merely classifying countries as between hungry or not on the basis of any evidence of malnutrition in the country. For on such a basis there becomes virtually no geography. All the world is hungry; there is no difference in this respect

between national regions. Yet this broadside approach is used by De Castro; he says, for instance, "A few cases will suffice to prove that no nation or geographic area on the American continent is entirely free from the perils of hunger and malnutrition."

Some discrimination as to degree of malnutrition is needed in describing the geography. In many, if not most, countries, especially those likely to be ranked low in nutrition, there is insufficient direct evidence of nutritional intake to be able to establish this degree. Much of the classification is based on indirect evidence obtained by examining one ratio, the proportion of calories obtained from starchy staples, presumed to be low in health-protecting nutrients, in the total calorie intake. Inference of malnutrition appears safe when the ratio is very high, at least two-thirds, but this cannot be considered wholly adequate evidence.

The geography of both caloric deficiency, if there is any, and vitamin-mineral deficiency suffer from lack of regional discrimination within the national units. Whole nations are classified on a calorie basis according to the national average. However low that average is, there must be substantial elements of population with an intake below that average, as well as some above, and these are not apt to be uniformly distributed throughout a country. This geography, and demography, may be of equal or greater importance than that based on the national average unit.

De Castro professes to a rosy view of the future despite the stark geography he draws. But if the conditions of achieving this happy state are as he sees them, then many others of us may be far from being so optimistic. National, or colonial, specialization in production of certain raw materials must be ended, according to his view. But such a change in economies will only partially remedy the present world "hunger." The economic system of present civilization, except perhaps in socialist or communist countries, is said to be rooted in hunger, and would also have to change. Even economics as a science must be revamped, from being a science of human misery, as he puts it, to becoming an instrument for balanced distribution of the good things of the earth.

Bennett's view is more conservative. He says that over a 50-year period, but scarcely in less time, the most glaring deficiencies could be eliminated. In that time there would be, however, no possibility of geographically equalizing nutrition at the present level of the advanced countries. The limited advance would depend on freedom from war and from economic "autarky."

While it is likely that economic development will improve nutrition conditions, Bennett suggests that it will not necessarily do so. It is not only poverty that makes for malnutrition but also ignorance as well as people's preferences between foods. For the latter reason even wealthy countries may show nutritional deficiency. When income rises the consumption of sugar, fats, and highly refined grains rises; caloric intake increases but the quality of nutrition may decline. The intake of starchy food has declined as income has risen in the United States; this is a favorable feature. One may wonder, however, what the change in diet composition will be in a country like India; as income rises will diet composition include more starches, from highly refined grains, as well as more fat and more sugar?

THE BASIC FOOD CROPS OF JAVA AND MADURA

Don C. Bennett

Dr. Bennett is an Assistant Professor of Geography at Indiana University. He spent the period 1953–1955 in the Netherlands and Indonesia on research grants from the Ford Foundation.

THE diet of the people of Java and Madura is composed very largely of foods derived from seven basic crops: wet rice, corn, cassava, soybeans, dry rice, peanuts, and sweet potatoes. No attempt has been made to bring up to date our knowledge of the distributional aspects of these crops since the work of Van Valkenburg in the mid 1930's.[1] That discussion was largely concerned with describing individual crops and did not attempt to show crop association patterns. Later studies having to do with Javanese agriculture have described the distribution of these crops with a broad brush, never below the provincial level.[2] This article is an attempt partly to fill in these gaps, namely: (1) to determine and describe the variety and patterns of basic food crop combinations, and (2) to examine in detail the distributions of the individual crops as they are a part of the total crop association.[3]

The territorial unit used is the *kabupaten*, of which there are 86 in Java and Madura. Six of these are primarily urban areas: the kabupatens of Djakarta, Bandung, Jogjakarta, Surakarta, Semarang, and Surabaja (Fig. 1). Even though some of the kabupatens are large enough to include significant land use diversity, they are generally of a size to provide a rather detailed distributional picture and, with the exception of the urban areas, do not vary greatly in size.

Cultivated land, as used in this paper, includes the *sawah* (irrigated) and *tegal* (unirrigated) open fields but excludes the garden areas that are closely associated with dwellings. Normally, the seven basic crops are not planted in the gardens. It should also be remembered that these crops do not occupy all of the cultivated land, since such crops as tobacco and sugar cane are widely grown. However, known conditions in East Java indicate that the seven major food crops do occupy the overwhelming proportion of the total cultivated area since the subsidiary crops are grown on less than 6 per cent of the total.[4] Leased tree plantation areas are also excluded from the data on native cultivated lands.

A significant distinction in Javanese agricultural land use is that between the sawah and tegal lands, since the sawah lands are considerably more

[1] Samuel Van Valkenburg: "Agricultural Regions of Asia, Part IX: Java," *Econ. Geog.*, Vol. 12, 1936, pp. 27–44.

[2] Java is divided into three provinces: West, Central, and East.

[3] All data used in this paper refer to 1953 statistics gathered at the Central Statistical Office, Djakarta. This research was made possible by grants from the Ford Foundation although they are in no way responsible for any statements in the paper.

[4] Don C. Bennett: *Population Pressure in East Java*, Ph.D. Dissertation, Syracuse University, Syracuse, N. Y., 1957, p. 42.

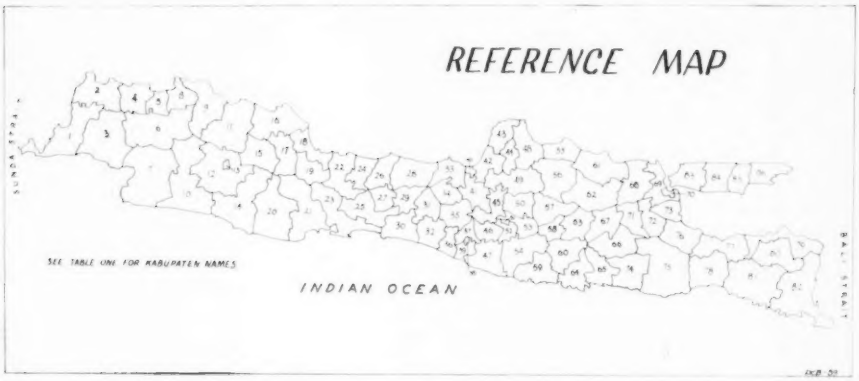

FIG. 1. Reference map. Numbers refer as follows:

Map Number	*Kabupaten*	*Map Number*	*Kabupaten*	*Map Number*	*Kabupaten*
29	Bandjarnegara	46	Klaten	84	Sampang
12	Bandung	9	Krawang	41	Semarang
13	Bandung City	44	Kudus	40	Semarang City
83	Bangkalen	36	Kulonprogo	2	Serang
25	Banjumas	19	Kuningan	73	Sidoardjo
82	Banjuwangi	68	Lamongan	37	Sleman
39	Bantul	3	Lebak	50	Sragen
8	Bakasi	78	Lumadjang	11	Subang
74	Blitar	63	Madiun	7	Sukabumi
56	Blora	17	Madjalenka	52	Sukohardjo
62	Bodjonegoro	35	Magelang	15	Sumedang
6	Bogor	58	Magetan	86	Sumenep
45	Bojolali	75	Malang	69	Surabaja
80	Bondowoso	72	Modjokerto	70	Surabaja City
22	Brebes	67	Ngandjuk	51	Surakarta City
42	Demak	57	Ngawi	20	Tasikmalaja
5	Djakarta City	85	Pamekasan	24	Tegal
43	Djapara	79	Panarukan	34	Temanggung
81	Djember	1	Pandeglang	4	Tengerang
71	Djombang	76	Pasuruan	18	Tjeribon
14	Garut	48	Pati	21	Tjiamis
49	Grobogun	59	Patjitan	10	Tjiandjur
47	Gunungkidul	28	Pekalongan	23	Tjilatjap
16	Indramaju	26	Pemalang	64	Trenggalek
38	Jogjakarta City	60	Ponorogo	61	Tuban
53	Karanganjar	77	Probolinggo	65	Tulungagung
30	Kebumen	27	Purbolinggo	54	Wonogiri
66	Kediri	32	Purworedjo	31	Wonosobo
33	Kendal	55	Rembang		

productive than the tegal and are the only areas on which wet rice can be grown. The sawah area accounted for 42 per cent, or 34,334,000 hectares, of the cultivated land area in 1953.

Multiple cropping is widespread in Java and Madura and significantly enlarges the harvested area as opposed to the cultivated land area. Practiced predominantly on sawah, multiple cropping means the equivalent of 39 per cent more sawah land on which the basic food crops are grown, indicating a high intensity of use. The areal importance of the basic food crops, in all cases, has been evaluated in relation to the *harvested* area rather than to the *cultivated* area.

Multiple cropping on sawah lands is most important in eastern Java,

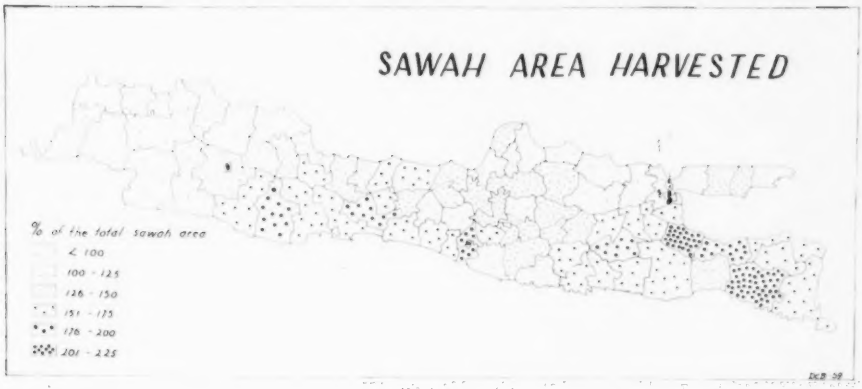

FIG. 2.

where several regions record a harvested sawah area which is at least 175 per cent of the sawah land area (Fig. 2). At the other extreme, there are several areas where the rate of multiple cropping of sawah is no more than 125 per cent. These are located west of Djakarta-Bandung, along the northern coast from Japara to Surabaja, in a few scattered areas of central Java, and on Madura Island.

The intensity of cultivation of the basic food crops on tegal is much lower than that on sawah although the distributional patterns of intensity are similar. In general, the tegal areas having the lowest intensity of use are in the west and increase toward the east.

CROP COMBINATIONS

A knowledge of the particular combination of crops and the relative importance of each in an area, i.e., the crop combination, can be very useful in understanding aspects of the economic and social geography of an area. Weaver lists three directions in which crop combination information may have significance. He points out that they are essential to an adequate understanding of the individual crop geography; that the crop combination region, itself, is an integrative reality that requires definitions and distributional analysis; and that such regions are essential for the construction of the still more complex structures of

TABLE I

THE MAJOR FOOD CROPS OF JAVA AND MADURA IN 1953

	Wet rice	*Corn*	*Cassava*	*Soybeans*	*Dry rice*	*Peanuts*	*Sweet potatoes*
Sawah Harvest (100 ha)	37,421	4,248	635	3,318	464	1,038	809
Tegal Harvest (100 ha)	.....	10,738	8,034	924	2,524	1,355	1,365
Total Harvest (100 ha)	37,421	14,986	8,669	4,242	2,988	2,393	2,174
% Sawah Harvest	78	9	1	7	1	2	2
% Tegal Harvest	0	44	32	4	10	5	5
% Total Harvest	51	22	12	6	3	3	3
% Sawah	100	28	7	78	15	43	37
% Tegal	0	72	93	22	85	57	63

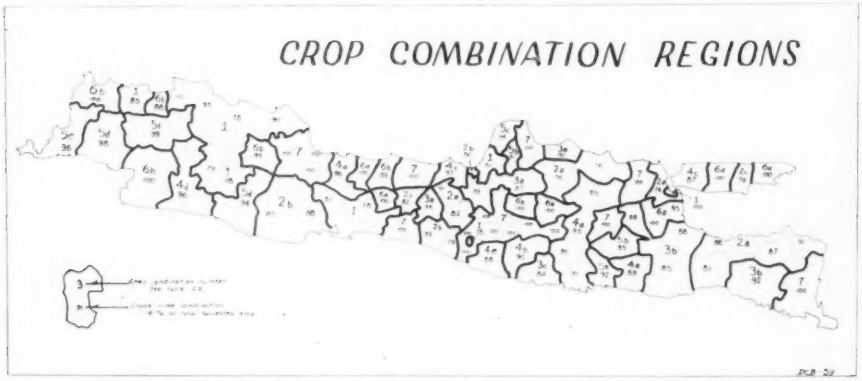

FIG. 3.

agricultural regions.[5] In addition, crop combination regions may be used to evaluate such conditions as dietary adequacy and labor under- or unemployment in essentially agrarian economies. The crop combination regions depicted in Figure 3 are those that show the smallest deviation from theoretical model curves using the formula:

$$\acute{\iota} = \frac{\Sigma d^2}{n}$$

where:

$\acute{\iota}$ = deviation
d = difference between the actual crop percentage in an area and the theoretical curve
n = number of crops in a given combination

The 21 crop combination regions shown on Figure 3 indicate the number and kind of crops composing the region and the percentage of the total harvested area that these occupy in that area. Figure 4 indicates the areally most important crop, the percentage of the total harvested area it occupies, and the crop diversity or specialization of each kabupaten.

A striking feature of Javanese agriculture as shown by Figure 3 is the areal variety of crop combinations. The distribution of the 21 recognized combinations present few examples of large clusters of kabupatens. The coherent area having the largest number (seven) of similar kabupatens is a 7-crop region (the least specialized) in the vicinity of Jogjakarta-Surakarta. There is also a large 1-crop wet rice area (six kabupatens) along the northern coast eastward from Djakarta. Other groupings include the 2-crop corn-wet rice area at the eastern end of the island and a 4-crop wet rice-corn-cassava-soybeans region that extends north

[5] John Weaver: "Crop Combination Regions in the Middlewest," *Geogr. Rev.*, Vol. 44, 1954, p. 176.

TABLE II

CROP COMBINATION REGIONS

1	Wet rice
2a	Wet rice—corn
2b	Wet rice—cassava
2c	Corn—cassava
3a	Wet rice—corn—cassava
3b	Wet rice—corn—soybeans
3c	Wet rice—cassava—dry rice
4a	Wet rice—corn—cassava—soybeans
4b	Wet rice—corn—cassava—dry rice
4c	Wet rice—corn—cassava—sweet potato
4d	Wet rice—cassava—dry rice—sweet potato
4e	Corn—cassava—dry rice—peanuts
5a	Wet rice—corn—cassava—soybeans—dry rice
5b	Wet rice—corn—cassava—soybeans—sweet potato
5c	Wet rice—corn—cassava—dry rice—peanuts
5d	Wet rice—corn—cassava—dry rice—sweet potato
5e	Wet rice—cassava—soybeans—dry rice—sweet potato
5f	Wet rice—cassava—dry rice—peanuts—sweet potato
6a	Wet rice—corn—cassava—soybeans—peanuts—sweet potato
6b	Wet rice—corn—cassava—dry rice—peanuts—sweet potato
7	All crops

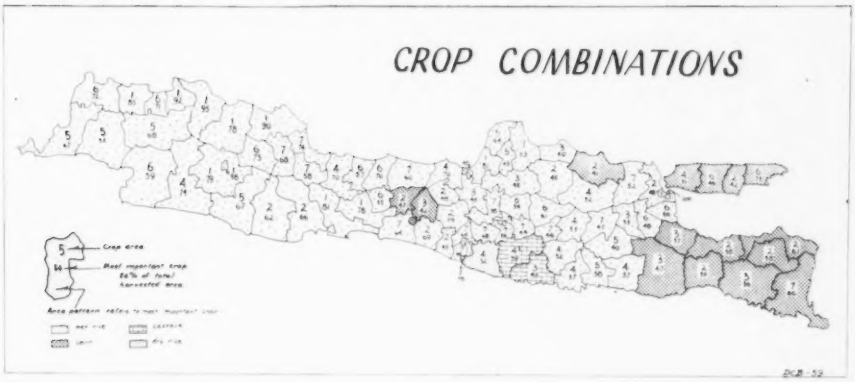

FIG. 4.

and south of Madiun. Elsewhere there are a few locations where the same combination is found in two or three adjacent kabupatens, but on the whole one is struck by the fractured nature of the distributions, the relative absence of extensive areal similarity, and the scattered nature of kabupatens having similar conditions.

A second important feature of Javanese crop combination regions is the relative dominance of the particular combination crops in any area. In the 1-, 2-, 3-, and 4-crop areas the areal importance of these crops is very high, generally over 85 per cent of the total, indicating the specialized nature of these regions.

The dominant position of wet rice in Javanese agricultural land use is clearly shown by Figure 4. In all, it is areally the most important crop in 68 of the 86 kabupatens, giving way to corn, cassava, and dry rice in local areas. Thirteen kabupatens are 1-crop wet rice areas; it is the only crop that so dominates as to be a 1-crop region. Four of the 13 are urban areas, reflecting the insignificant development of market gardening around the large Javanese cities. Throughout the rural 1-crop wet rice regions the harvested area of wet rice varies from 78 per cent (Subang, Banjumas) to 95 per cent (Krawang) of the total harvested area. There is a marked concentration of the rural 1-crop areas along the northern coast of western Java from Tangerang to Tjeribon, mentioned above. In the interior, Bandung Kabupaten in the west and Demak, Banjumas, and Tjilatjap Kabupatens in central Java are 1-crop wet rice areas. With the single exception of Surabaja City there is no area in eastern Java where wet rice so dominates. Again, this extraordinary position is substantiated by the large number (34 per cent) of 1- or 2-crop kabupatens in which wet rice is represented.

All 2-crop regions, of which there are three types, are some combination of wet rice, corn, and cassava. Ten of the sixteen 2-crop kabupatens are combinations of wet rice and corn, five of wet rice and cassava, and one of corn and cassava. Thus, wet rice figures in all but one of these regions. It should be noted that corn becomes increasingly important toward the east and, in fact, occupies a larger harvested area than wet rice in six of the ten wet rice and corn areas, especially those farthest east.

In contrast to the 1-crop areas, the

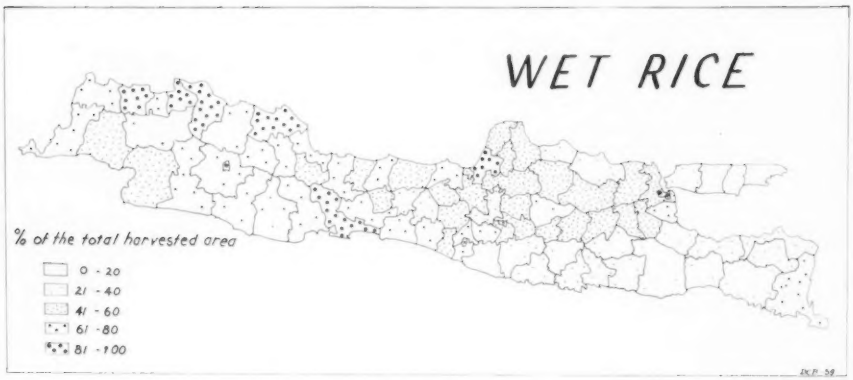

FIG. 5.

2-crop areas are largely located in central and eastern Java. The wet rice-corn combination is the only 2-crop combination found east of a meridional line through Semarang and also occupies the three interior central Java 2-crop kabupatens. A wet rice-cassava combination occurs at two separated locations along the southern coast from Tasikmalaya to Kulonprogo. Semarang City is also a wet rice-cassava area. Pamekasan, on Madura Island, is the only kabupaten where a corn-cassava combination prevails.

The same three crops—wet rice, corn, and cassava—figure strongly in the 3-crop combinations; in addition, soybeans are prominent and dry rice is locally important. There are two major 3-crop combinations, wet rice-corn-cassava and wet rice-corn-soybeans, and three minor combinations. The distribution of 3-crop combinations is confined to an area east of a meridional line through Wonosobo. The wet rice-corn-cassava combination is found in four disconnected kabupatens in central Java. The wet rice-corn-soybean regions lie adjacent to the 2-crop wet rice-corn areas in the far eastern part of Java. Wet rice occupies more area than corn over most of the wet rice-corn-cassava regions while corn dominates wet rice throughout the wet rice-corn-soybean areas. A cassava-wet rice-dry rice area is confined to Patjitan Kabupaten, along the hilly southern coast.

All seven major food crops are represented in each of the 4-, 5-, 6-, and 7-crop combinations. There are five 4-crop combination types, six 5-crop combination types, and two 6-crop combination types. Wet rice is absent from only one of these fourteen combinations. This is at Gunungkidul Kabupaten in the hills south of Jogjakarta-Surakarta.

There are only two 6-crop combinations: (a) without soybeans and (b) without dry rice. Soybeans are insignificant in the area west of Tjeribon and dry rice is similarly of little importance in the area east of Ngawi.

The areas having the least crop specialization, the 6- and 7-crop areas, represent a third of the total kabupatens (29). They are distributed widely from west to east and north to south but lie principally in the central and eastern sections of Java. There is an evident tendency toward rather large clusters separated from each other. The largest nonspecialized zone (includ-

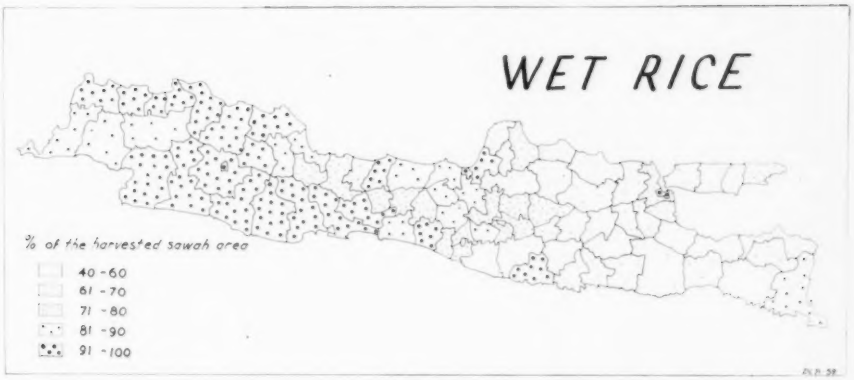

FIG. 6.

ing 13 kabupatens) extends with only small interruption from Bantul eastward to Surabaja and Sidoardjo. A second zone (five kabupatens) extends across the island from Tegal-Wonosobo on the Java Sea to Kebumen on the Indian Ocean. The third large region lies between Bandung and Tjeribon and includes four kabupatens. The remaining five nonspecialized kabupatens are widely dispersed.

WET RICE

The paramount position of wet rice in the food crop picture of most of Java and Madura has been partially described. It occupies more land than any other crop in no less than 68 of the 86 kabupatens. There are only two kabupatens that utilize less than half (44 per cent and 49 per cent respectively) of the total sawah harvested area for wet rice production. The median wet rice harvested acreage is 78 per cent and there are 19 kabupatens (22 per cent) in which over 95 per cent of the harvested sawah area is with wet rice. Notwithstanding its predominant role, there exists a considerable areal variation in the degree of importance that wet rice has. In Gunungkidul Kabupaten only 4 per cent of the harvested area is wet rice; in Surabaja Kabupaten it approaches 100 per cent. The median value for all kabupatens is 53 per cent. Figure 5 shows the percentage of the total harvested area occupied by wet rice. West from a meridional line through Tjeribon it generally occupies 60 per cent or more of the harvested area with most of this area having values over 70 per cent; between Tjeribon and a meridional line through Semarang values between 20 and 81 per cent occur with most of the area under 70 per cent; east of Semarang wet rice values generally vary between 20 and 70 per cent with most of the area having values under 50 per cent. Banjuwangi, the easternmost kabupaten on Java, with 66 per cent, shows an especially high intensity of wet rice for this part of the island. Madura Island is exceptional in that it has the only extensive area where wet rice is less than 20 per cent of the harvested acreage, with values about 10 per cent.

Wet rice is, of course, grown only on sawah lands, the fields that can be irrigated. The relative position of this crop is better understood if we examine its importance on just these lands. The distributional pattern, as shown by

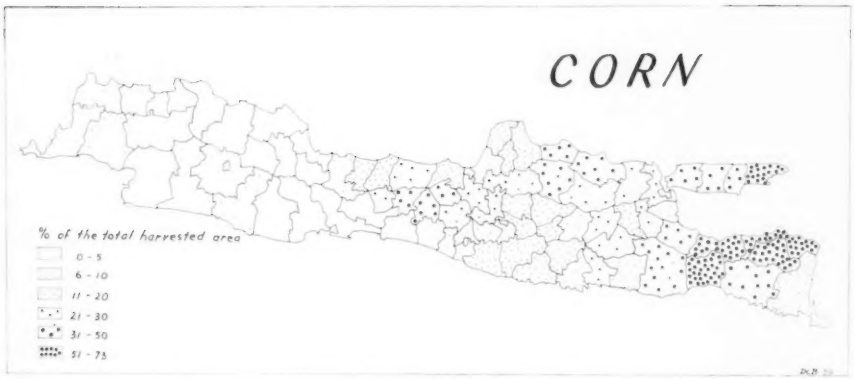

FIG. 7.

Figure 6, may be summarized as follows: West from Tjeribon it occupies 86 per cent or more of the harvested sawah area; between Tjeribon and Semarang is a zone in which the importance of wet rice varies between 60 and 100 per cent; east of Semarang values between 60 and 70 per cent are most common, and in several kabupatens wet rice occupies less than half of the harvested sawah. The low position of wet rice on Madura Island and Gunungkidul Kabupaten is due not only to the relative absence of sawah lands but also to a preference for other crops.

CORN

Corn is the second most important food crop. In 1953, it occupied 22 per cent of the major food crop acreage. It is grown on tegal as a wet season crop and on sawah as a dry season crop. The areal importance of this crop is explained in part by the relative predominance of sawah or tegal lands. There are very few areas in Java in which corn equals wet rice in harvested land acreage. The median value of the corn harvest relative to the total harvested area is only 12 per cent. This rises to 26 per cent on just the tegal lands and declines to only 5 per cent on just the sawah lands. In almost 40 per cent of the kabupatens, 5 per cent or less of the harvested area is in corn; it exceeds 50 per cent in only five kabupatens.

The areal pattern of the corn harvest is almost the reverse for that of wet rice (Fig. 7). The areas of greatest corn intensity, where it occupies more than half of the cultivated land, are confined to the eastern tips of Java and Madura. In addition, there are important zones near Rembang-Tuban along the northeastern coast and again in central Java at Bandjarnegara-Temanggung-Wonosobo, where 30 to 50 per cent of the harvested area is in corn. In almost all of the area west of Tjeribon and in a zone extending east of that city along the southern coast to Jogjakarta the harvested acreage of corn is less than 5 per cent of the total.

Seventy-two per cent of the corn harvest is from tegal lands. Indeed, corn occupies over half of the tegal acreage in a continuous zone from the Strait of Bali westward through Malang Kabupaten and then along the north coast to Rembang. A similar area of intensity exists between Bandjarnegara and Magelang in interior central Java. In general, harvest values of corn on

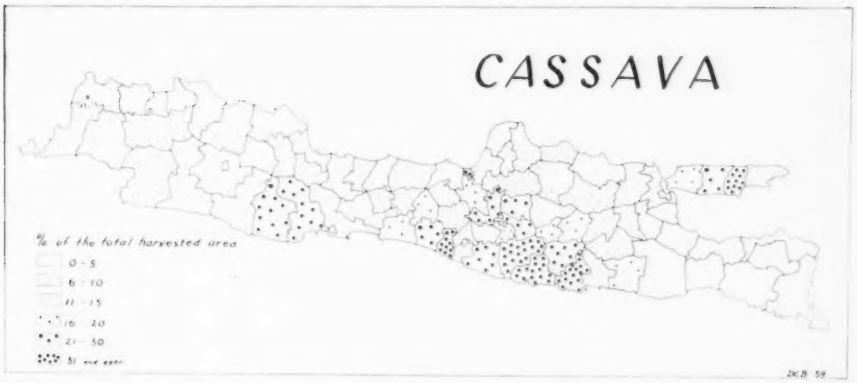

FIG. 8.

tegal are 20 per cent or more north and east of a line between Tjeribon and Jogjakarta while south and west of this line values are everywhere less than 20 per cent and predominantly less than 10 per cent.

The areal pattern of corn intensity on sawah lands is very similar to that on tegal. The same diagonal line between Tjeribon and Jogjakarta neatly separates the western half, where less than 1 per cent of the sawah is planted to corn, from the eastern half where upwards of 33 per cent is so planted. The most important sawah-grown corn area extends from Rembang to the Strait of Bali.

The relatively important position of corn in eastern Java results first from its dominant position on the tegal lands and, second, from its high status as a sawah-grown crop in this area. Generally, less than 10 per cent of the local corn comes from sawah lands in the west of Java; in many areas in the eastern part of the island, 50 to 80 per cent is sawah-grown.

CASSAVA

Cassava, harvested from 12 per cent of the total harvested area, is the third ranking food crop in Java and Madura and owes this position largely to its cultivation on tegal lands. Grown extensively, it occupies at least 1 per cent of the total harvested area in all but two kabupatens although the median harvest area value is only 10 per cent. In 80 per cent of the kabupatens, cassava represents less than 20 per cent of the total harvested acreage. Consequently, cassava is a part of the land use pattern in virtually all areas although it assumes major significance in only a relatively small area (Fig. 8). It has greatest areal importance in a triangular area bounded by Purworedjo, Patjitan, and Sragen in south central Java, where it generally accounts for over 20 per cent of the harvested area. A second important region includes Tasikmalaya and Tjiamis, also along the southern coast. On the other hand, there are two widely separated large areas in which cassava is very minor, less than 5 per cent: along the northwestern coast from Tangerang to Brebes and in the area east of Surabaja-Malang.

Cassava is overwhelmingly a tegal crop, 93 per cent of its harvested area, and as such it figures far more prominently in the tegal harvested acreages than in the total harvested acreages.

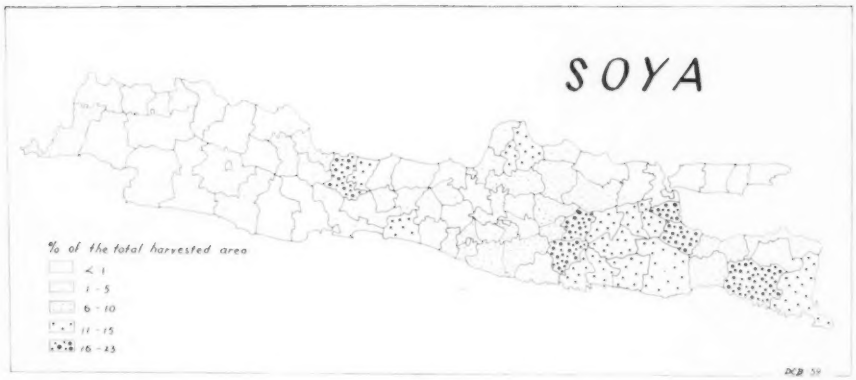

FIG. 9.

The median harvest of cassava on tegal is 36 per cent of the total tegal harvested area. In 22 kabupatens it exceeds 50 per cent and in only 14 kabupatens is it harvested from 20 per cent or less of the tegal harvested area. With few exceptions, the areas in which cassava occupies more than 50 per cent of the harvested tegal area extend along the south of Java from Bandung to Madiun. It is least important, less than 20 per cent of the harvested tegal area, east of Surabaja-Malang. A point of interest is that cassava has a greater importance in the urban areas of Djakarta and Semarang than in their immediate hinterlands, although the opposite condition prevails with respect to all other major cities.

The long-maturing requirements of cassava are primarily responsible for its insignificant occupance of sawah lands. Only four kabupatens record a cassava harvest greater than 5 per cent of the total harvested sawah area. The median sawah occupance is only 1 per cent. The distributional pattern on sawah is in three large compact blocks: In the central area, Tjeribon to Surabaja, cassava occupies from 1 to 5 per cent of the harvested sawah acreage while in the two zones on either side the values are less than 1 per cent.

Over 90 per cent of the harvested cassava is from tegal lands throughout the major part of Java. Two exceptions are a rather large interior region which lies between meridional lines through Semarang and Surabaja, and a much smaller region along the northern coast from Krawang to Tegal.

SOYBEANS

Soybeans are the fourth most important food crop and are harvested from 6 per cent of the total harvested area. They are cultivated mainly as a second crop on sawah but are also grown on tegal. Although occupying a greater area than either dry rice, peanuts, or sweet potatoes, soybeans are the most areally restricted of the major food crops. They are entirely absent from five urban and four rural kabupatens.

The greatest cultivation of soybeans, by far, occurs in the area east of Semarang-Jogjakarta (Fig. 9). Within this large region the crop is extensively cultivated and reaches its maximum concentration in a compact area between Ponorogo, Surabaja, and Malang,

FIG. 10.

where the harvested area of soybeans is between 10 and 23 per cent of the total harvested area. Lesser values, from 1 to 10 per cent occur extensively along the northern coast. West of Semarang-Jogjakarta to Tjeribon is a transition zone with a few important soybean areas but many kabupatens which, with the areas west of Tjeribon, have less than 1 per cent of their harvested area in soybeans. The one area of significant concentration west of Semarang is along the northern coast between Tegal and Brebes. Almost no soybeans are grown on Madura Island.

The geographic distribution of the soybean harvest from either sawah or tegal lands individually is very similar to that for the total harvested lands. The maximum cultivation on sawah is 32 per cent while the median is only 3 per cent. On tegal the maximum and median are 16 and 1 per cent, respectively.

DRY RICE

Unirrigated, or dry rice, occupies only 8 per cent as much of the total harvested area as wet rice and only 70 per cent as much as soybeans. About 85 per cent of the dry rice is harvested from tegal lands at the close of the wet season. Altogether it represents only 2 per cent of the harvested area of the major food crops.

There are two areas of major concentration. The largest of these extends through 18 kabupatens along the southern coast from Sunda Strait to Kuningan (Fig. 10). In this area dry rice accounts for over 6 per cent of the harvested area of the major crops and in the extreme western part exceeds 10 per cent. The second areal nucleus, though less extensive, is also located along the southern coast, from Patjitan to Blitar. Here, the intensity of cultivation ranges between 6 and 10 per cent of the harvested area. Small discontinuous areas in which dry rice has greater than average importance are found at Djepara-Kudus, Lamongan-Surabaja, and again at Pamekasan-Sampang on Madura Island.

Although considered a minor food crop in general, dry rice attains major importance on tegal lands areally. The median value is only 5 per cent on these lands, yet throughout the greater part of the area west of Bandung it accounts for between 30 and 50 per cent of the harvested tegal area. Elsewhere, tegal-grown dry rice has greater areal importance along the southern coast than

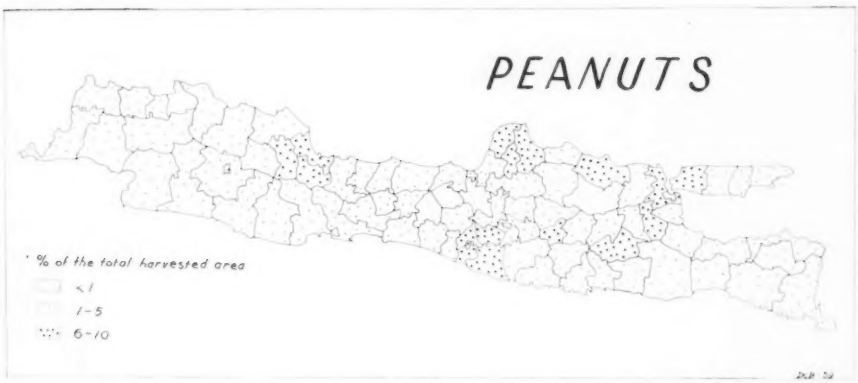

FIG. 11.

in the interior or northern coastal areas.

On sawah, the median harvest figure is only a fraction of 1 per cent of the total sawah harvest. Indeed, 58 kabupatens record no dry rice harvested from sawah lands. The major area of sawah-grown dry rice is in a broad central zone bounded by Semarang-Surabaja-Madiun-Jogjakarta.

PEANUTS

Peanuts occupy relatively small acreages in all parts of Java and Madura. Nowhere are they harvested from more than 10 per cent of the total harvested area and the median harvested area is only between 2 and 3 per cent of the total. On the other hand, there are no rural areas in which peanuts are entirely absent. They are of greatest local importance in a zone bounded by a line connecting Semarang-Jogjakarta-Surabaja and again near Tjeribon where they occupy between 6 and 10 per cent of the total harvested land in several kabupatens (Fig. 11).

The distributional pattern of peanut cultivation on sawah lands is broadly similar to that for the total peanut harvest. This crop is seldom grown on the sawah lands west of Tjeribon. In urban areas, too, peanuts are not popular.

The pattern of peanut cultivation on tegal, on the other hand, is quite different. On these lands, median cultivation is 5 per cent of the tegal total. They reach their greatest intensity as a tegal crop in Tjeribon and Madjalenka where 22 and 25 per cent, respectively, of the tegal is in peanuts. A somewhat less intense cultivation occurs along the northern coast on either side of Djakarta and again just west of Surabaja.

Although the total peanut harvest shows them to be grown about equally on sawah and tegal, local patterns show wide variations. They are predominantly a sawah crop (over 80 per cent) in very limited areas: at five kabupatens near Jogjakarta and at Panarukan Kabupaten in the east. On the other hand, there are 27 kabupatens in which 80 per cent or more of the peanuts are grown on tegal. These are largely concentrated west of a meridional line through Tjeribon with secondary areas on Madura Island and the adjacent northern coast from Surabaja to Tuban. Elsewhere, peanuts are harvested about equally from sawah and tegal.

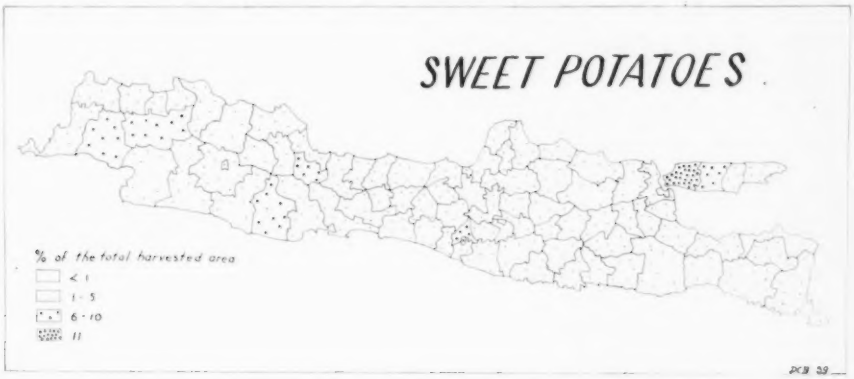

FIG. 12.

SWEET POTATOES

In 1953, sweet potatoes were harvested from approximately the same acreage as peanuts, 2,174,000 hectares. Almost two-thirds are grown on tegal and they account for 5 per cent of the harvested tegal acreage whereas they represent only 3 per cent of the total harvested area of the major food crops (Fig. 12).

In 22 of the kabupatens, over 80 per cent of the sweet potatoes are grown on tegal. As a tegal crop they are areally most important west of a meridional line through Pekalongan and assume greatest importance along the northern coast where they occupy between 11 and 20 per cent of the harvested tegal area. Very few sweet potatoes are grown in the vicinity of Bandung. East of Pekalongan, they represent 10 per cent of the harvested tegal area in large sections of the northern coastal plain and less than 5 per cent south of the plain.

As a sawah crop, the median harvested area of sweet potatoes is only 1 per cent of the total. The areas of greatest intensity are found in the extreme west near Lebak and Bogor, somewhat east at Kuningan, and on Madura Island, where they form between 6 and 10 per cent of the harvested sawah acreage. Interestingly, the northern coastal plain of western Java is a major tegal-grown sweet potato region and a very minor region of sawah-grown potatoes.

SUMMARY

This examination of the distributional qualities of the seven major food crops of Java and Madura has been focused on the distinctive combinations of crops that exist and on the areal significance of each crop as a part of the total. This method of geographic investigation has shown Java to have a highly diversified crop pattern. Even wet rice does not figure importantly in all areas. To what extent this pattern of crops is related to climate, soil, water availability, market, population density, or custom would make fruitful lines of investigation. There is also a need for comparable studies of other predominantly wet rice areas.

BOOK REVIEWS

The Conurbations of Great Britain, by T. W. FREEMAN, with a chapter on *The Scottish Conurbations*, by CATHERINE P. SNODGRASS. x and 393 pp.; maps, tables, bibliogr., and index. Manchester University Press, Manchester, U. K., 1959. 37s.6d. net. 8¾ x 5¾ inches.

The term "conurbation" was first used by Sir Patrick Geddes, developed by C. B. Fawcett, and received official recognition from the Registrar-General of the United Kingdom in the Census of 1951. Now Mr. Freeman and his co-author have given us the first full-length study of the British conurbations. All four of these authorities have encountered similar difficulties in defining and delimiting their selected areas of urban agglomeration but their use of "conurbation" emphasizes one of the central facts in the geography of Great Britain, i.e., that "Of every ten people in England and Wales, eight live in towns and four live in one of the major conurbations . . . ; in Scotland also more than four-fifths of the population live in towns" (p. 1).

While fully acknowledging his indebtedness to Geddes and Fawcett, Freeman departs from the conventional approach to the study of conurbations by separating them into two groups, major and minor, the first consisting of the Greater London Conurbation, the West Midlands, Merseyside, the Manchester Conurbation, West Yorkshire, and Tyneside, in England; and the Central Clydeside Conurbation in Scotland. His minor conurbations, 89 in number, have a lower population limit of 50,000. Although many of the latter group are not generally recognized as conurbations, they exhibit many of the characteristic features of their larger counterparts and, therefore, justify the author's decision to regard them as "minor conurbations." Almost half of his book is devoted to the six major conurbations of England and about one-quarter (92 pp.) to the minor agglomerations of the same country while all the Scottish town groups are discussed in a separate chapter of 50 pages.

Because of the numerous changes in population distribution in Great Britain during the last 100 years, the delimitation of urban areas presents serious difficulties. In this context, one element is outstanding and that is the slow rate of adjustment to administrative boundaries to changing population patterns. Here is a problem with which all students of urban geography are familiar and for which none has found a fully satisfactory solution. As Freeman states ". . . for statistical purposes a conurbation must be defined in terms of existing administrative areas" yet ". . . these units differ enormously from one case to another . . . because the administrative districts owe their present form to a mass of local historical, economic and political factors" (p. 10). Hence, any attempt to bring about a rational politico-territorial structure, even for the purposes of parliamentary representation, inevitably meets opposition which has been sufficiently powerful to cause the abandonment of the work of the Boundary Commission.

This difficulty has been exacerbated in Great Britain, despite the absence of a recent "population explosion," by two distinct trends. The "drift to the towns" continues but has been supplemented by an outward movement of people from the inner districts towards the urban peripheries. Thus urban sprawl with its characteristic feature of metro-monotony, as it was recently described in an American newspaper, is encroaching on the countryside, frequently absorbing good agricultural land, and creating new problems for administrators and, among others, geographers. It would be unreasonable to expect boundary changes frequent enough to keep pace with extensions of built-up areas but that numerous adjustments in delimitation are desirable can hardly be denied. More than 30 years ago, Fawcett made a reasoned plea for a regrouping of administrative areas in his *Provinces of Britain*. The only major change in this direction was the creation of the County of London in 1888 but ". . . the area of the L.C.C. was archaic from the first moment of its birth" (p. 48). It is within the framework of these seemingly insurmountable difficulties that a study such as Freeman's must be judged. He has made extensive use of Ordnance Survey maps as well as the British Museum's rich map collection, but the lack of coincidence between continuously urban areas and administrative units forces him to make arbitrary decisions in the delimitation of his conurbations.

The author's declared aim has been ". . . to shed some light on the distribution of the town population in the nineteen-fifties, rather than to

prophesy, or to give any kind of directive for planners" (p. vi). The reader will not, therefore, expect a profoundly theoretical approach to the study of towns. On the contrary, *The Conurbations of Great Britain* is an assemblage of practical studies of 95 urban groups with a strong emphasis on the historical development of each of them. The author's treatment of the six major conurbations reveals his marked ability to select the relevant factors and his skill in handling a wealth of information. His chapter on "The Greater London Conurbation" is an excellent example of condensation (in 54 pages) yet there are no major omissions. Much of his information has been compiled from original sources, including his personal knowledge of many of the British towns, and his 24 pages of "Notes and References" are a valuable addition to his text.

The Conurbations of Great Britain is illustrated by 64 maps in the text as well as an end-paper map showing the distribution of the major and minor conurbations of England and Wales. The present reviewer is not aware of any comparable series of maps in one collection. The author and his publisher have shown considerable skill in overcoming the problems of scale imposed by a page size of $8\frac{3}{4}$ by $5\frac{3}{4}$ inches so that most of the maps are generally legible although readers may have trouble in deciphering some of the place names, e.g., on Figure 37, "Built-up Areas in West Yorkshire, 1950."

There can be no doubt that Mr. Freeman and his associate author have made an outstanding contribution to the literature on the geography of Britain. They have not said the last word on their chosen subject. As Freeman notes "Twenty years from now the distribution of our population will be considerably changed: so too, one hopes, will our towns" (p. vi). The possibilities of further spatial change are apparent in his suggestion that " 'Wider still and wider shall thy bounds be set' could well be the motto of any considerable industrial town" (p. 353).

A. E. MOODIE

Northwestern University

The Individuality of Portugal: A Study in Historical-Political Geography, by DAN STANISLAWSKI. xiv and 248 pp.; maps, ills., bibliogr., index. University of Texas Press, Austin, 1950. $5.00. $9\frac{1}{4}$ x 6 inches.

This is an important geographical study, and one which transcends in significance the immediate topic. In fact, both the title and subtitle could prove misleading, the one suggesting too much, the other too little. However, any such misunderstanding would not be the fault of the author, who very clearly states his objective, but would arise from the uncommon nature of the book, and therein lies much of its value. Those interested in Iberia will recognize Professor Stanislawski's contribution, but it deserves a wider audience, for any reader will have the pleasure and stimulus of accompanying a skilled cultural geographer at work as he sets forth a problem, methodically examines an impressive variety of evidence, and reaches a carefully evaluated conclusion. This is not to suggest that other geographers do not work in this manner, but it does appear that our American literature is peculiarly lean in studies of this type and scale.

The problem posed is simple to state: why is there a Portugal, as a separate state and people, in an Iberia which, superficially at least, appears to have many unitary characteristics? The Portuguese themselves, according to the author, while "in almost complete unanimity as to their individuality," differ widely in their explanations. Prevalent theories range from the purely political to the strongly physical (the latter argued skillfully by the German geographer Lautensach).

The first four chapters describe, in turn, the landforms, climate, soils, and vegetation of Portugal and related portions of Iberia. The detail is varied to suit the problem, emphasizing especially northwest Iberia and the national boundary zones. The principal themes are the general continuities of central-northwest European features through Cantabria into North Portugal and the contrasts with the remainder of the peninsula.

The next ten chapters are historical, covering the sequence of cultural and political movements from the Upper Palaeolithic to modern international relations. The dominant theme here is the persistent dualism between the north and northwest on the one hand, and the south and southeast on the other. This is revealed from the earliest evidences relating to the Cantabrian Palaeolithic and Capsian cultures, through a long succession of "joint tenants," such as Celtic and Carthaginian and Greek, Swabian and Visigothic, Christian and Moselem. Those ties which on occasion did exist between the two realms were always superficial. An important corollary of these patterns is the persistence of Atlantic Iberia as a remote, "offside," extremity of the influences from either central Europe or the Afro-Mediterranean area.

The existence of a distinct culture area from Cantabria to Galicia, Minho, and southward (in diminishing intensity) along the Atlantic lowlands to the Tejo was strongly reinforced by the Germanic migrations. Here the author most clearly illustrates a principle of cultural geography which he has stated in his introduction: "culture has roots, not only in men's minds, but in the land upon which it develops . . . when peoples migrate, taking with them their attitudes and values, they choose areas for settlement that broadly meet their habitual needs,

areas that are physically reminiscent of that from which they came" (p. 4). Thus the Visigoths, already heavily influenced by the Romans and pastoral cultures during their sojourn in the grasslands of southeastern Europe, selected the Meseta as their new homeland. The Swabians, as central European agriculturists long in contact with Celtic peoples, infiltrated into the familiar environment of the northwest corner. It was an important event: "much of the basis of living in present Galicia and North Portugal is a direct inheritance from the Swabian period of dominance."

Having established the cultural unity of Northwest Iberia, there remains the problem of the differentiation between Galicia and North Portugal. Stanislawski finds the answer in the complex history of Moslem expansion and expulsion. The zone between the Douro and Minho was made a "desert" by contending armies. Some peasants remained but long-standing political and economic ties with Galicia were broken while those between Galicia and Leon were reinforced. As the Moslems were pressed southward Castile dominated a weak Leon-Galicia whereas North Portugal was resettled largely from Lusitania (Douro-Tejo). With this, "Nuclear Portugal" began to emerge in Minho province and was strengthened by the dominance of a Burgundian nobility free of Spanish allegiance.

Portugal and Castile expanded southward in parallel. The author suggests that the area south of the Tejo was neither physically nor culturally related more to Portugal than Spain but was simply captured and systematically consolidated into the Portuguese state while Castile focused upon a stubborn Moslem Granada.

The final three chapters contain a review of the boundary areas, an exposition of the environment-cultural principle, and a summation of the factors of Portuguese individuality. Thus this work is neither a systematic description of Portuguese characteristics nor a narrow political study.

The book is fully documented and contains a lengthy bibliography of European source materials. Certainly one of the strengths is the author's citation and evaluation of conflicting theories. Illustrations include some fine photographs and 15 maps. There is, however, a serious deficiency in the latter for the Germanic, Moslem, and early national periods. Two further criticisms are perhaps warranted. The introductory physical materials might have been handled more effectively, non-geographers are likely to find these chapters overly detailed and technical in some respects. Secondly, while the author recognizes the existence of strongly separatist regions within Spain, at times his argument implies simple Portuguese-Spanish contrasts when these apply more properly only to Portugal and *adjacent* Spanish areas.

Such comments do not detract from the value of this study. If geographers are seriously concerned about differences from place to place then the book deserves attention for several reasons. First, it thoroughly elucidates the specific question posed and henceforth makes intolerable the continuation of the superficial textbook treatment of that issue. Secondly, it stands as a case study of the old and perhaps still controversial principle of environment and migration. Parenthetically, it should be noted that the author is careful to explain that this is not a principle of crude environmental determinism. Thirdly, it substantiates the necessity of culture history for the analysis of a wide range of questions of geographical concern. The economic geographer, for example, may well ponder the author's suggestion that through a long history cultural factors have played a major role in the economic differentiation between the Meseta and Portugal, markedly accentuating the obvious physical contrasts. Twenty years ago Carl Sauer concluded his scrutiny of American geography with the admonition that "either we must admit the whole span of man's existence [to our study] or abandon the expectation of major results from human geography." Professor Stanislawski has provided some solid corroboration of that view.

DONALD W. MEINIG

Syracuse University

Demographic Analysis: Selected Readings, by JOSEPH J. SPENGLER and OTIS DUDLEY DUNCAN (Editors). xiii and 819 pp.; maps, tables, bibliogr. The Free Press, Glencoe, Ill., 1956. $9.50. 9¼ x 6 inches.

Population Theory and Policy: Selected Readings, by JOSEPH J. SPENGLER and OTIS DUDLEY DUNCAN (Editors). x and 522 pp.; tables, bibliogr. The Free Press, Glencoe, Ill., 1956. $7.50. 9¼ x 6 inches.

The Study of Population: an Inventory and Appraisal, by PHILIP M. HAUSER and OTIS DUDLEY DUNCAN (Editors). xvi and 864 pp.; map, tables, bibliogrs., index. The University of Chicago Press, Chicago, 1959. $15.00. 9½ x 6¾ inches.

Because of the nonexistence of any book-length treatment of population geography (at least in English) and the unsuitability for their purposes of the three or four available texts on demography, those American geographers concerned with population studies will be particularly interested in the appearance of these three substantial compendia edited by Duncan, Hauser, and Spengler. Taken together, they may fairly be characterized as a basic library of information on population science. The two companion volumes, *Demographic Analysis*

and *Population Theory and Policy*, were planned as sourcebooks for outside readings in college courses on demography or, possibly, as the principal texts. The former consists of 63 articles that range in date from 1930 to 1956 but are concentrated chiefly in the postwar years; only two—those by A. P. Usher and J. Q. Stewart—might be classified as geographical, the remainder being derived almost wholly from sociological and economic sources. They "present varied demographic information, exemplify the work of the research demographer when he is dealing with delimited concrete problems and, in a number of instances, illustrate various points of methodological interest." In the 38 relatively recent papers that comprise *Population Theory and Policy*, on the other hand, "the results of demographic analyses are more or less assumed and these results are examined for their implications for socio-economic structure and change"; and, as would be expected, the selections are drawn entirely from the literature of sociology and economics. In both volumes, the editors have provided introductory discussions before each group of papers.

Anthologies of this sort are always fair game for critics who, whatever else they do, can challenge the exclusion of favorite pieces or the presence of others that try their patience. Here, however, the editors have carried out their job most judiciously, providing generous helpings of the best of the demographic literature and including only two or three items that fall below a high professional level. The shortcomings of these books can be assigned to the profession as a whole rather than to the editors. In the case of *Population Theory and Policy*, some of the papers, which appeared in the late 1930's or were strongly influenced by the currents of demographic thought then prevailing, now seem merely quaint; and almost all the others are obsolescent to varying degrees. In their multiplicity of approaches to the central problems of the discipline, the clash of opinions and methods, and a general sense of intellectual excitement while groping in the wilds of a vast new subject area, these are documents for the historian of ideas (or human error) rather than for the fledgling student who wants to gird himself with tried and true techniques. For the geographer, they are quite marginal in interest, especially since this material is so emphatically superseded by the contents of *The Study of Population*, excepting the group of papers on population policy, a topic specifically abjured by the latter.

The articles reprinted in *Demographic Analysis* are, as a whole, much less perishable, though generally pitched at a less pretentious level. A good half of the book, specifically the sections on population distribution, migration, and regional studies, will be of direct interest to the population geographer. The reporting and analysis of, say, population data for Burma in 1952 will be useful to researchers long after the dust has settled from the debate over whether the business cycle causes population change or whether things are the other way round. As a collection of examples of the best of the substantive accomplishments of population scholars, this volume stands quite alone and should be distinctly valuable for instructional purposes. A minor, but strongly irritating editorial flaw is the concealment of all citations of sources and dates in a prefatory thicket of acknowledgments.

The Study of Population, which is a much more formidable undertaking, contains 28 extended essays on the status of various phases of the discipline especially prepared by leading scholars in the United States, Great Britain, and several other nations, in addition to the five summary chapters written by the editors. Its announced purpose is "to provide a description and evaluation of the data, the fund of knowledge, the theory, and the methods of demography and its various subfields; to examine its relationship to other scientific disciplines; and to indicate important circumstances bearing on the development of demography in various parts of the world." Since this tome clearly invites comparison with other recent massive efforts at self-examination within the social sciences, specifically in sociology, anthropology, and geography, it should be said immediately that it is undoubtedly the best of the lot. In spite of an inevitable unevenness in quality and the abundant opportunities furnished the specialist reader to pick quarrels over matters of theory, technique, or evaluation, the results of this large-scale collaboration are most impressive. After the introductory section, in which Hauser and Duncan first ably distill the central implications of the material offered by the various contributors, they then present excellent, if rather lengthy, statements on the definition and content of the field, the data and the methods whereby they are handled, its theoretical substance, and the professional status and practice of demography, based largely on the symposium that follows. The body of the volume is divided into three sections: the first dealing with the history of demography in general (set forth in a most erudite and stimulating essay by Frank Lorimer) and the current status of the subject in seven leading scientific nations and in the Western Pacific area; a second—and most substantial—section consisting of monographs (some of which are wholly admirable in scope and depth) on past accomplishments, current knowledge, and the most promising frontiers for future investigation in the various subdivisions of demography; and, lastly, a group of essays exploring the inter-relationships of demography and seven neighboring disciplines, namely, animal ecology, human ecology, geog-

raphy, physical anthropology, genetics, economics, and sociology.

In evaluating this monumental publication, a few rather general observations are immediately in order. The achievement, the vitality, and the promise of the demographic profession, as here reported, are quite remarkable. They are all the more so in view of the small number of persons actively engaged in demographic work and the fact that demography is, academically speaking, an orphan subject throughout the world, being sheltered under the wings of other disciplines or finding refuge in various governmental bureaus. The essays in *The Study of Population* deviate only rarely from the highest canons of scholarship; there is an intense earnestness on the part of all the contributors and a strong inclination not only to chart the surface of the given topic but to plumb its deepest implications. The writers have, for the most part, successfully avoided open partisanship for their favorite hypotheses or current research project. There is a minimum of intramural strife but an abundance of sharp and almost too severe self-criticism. Fortunately, there are almost no descents into the jargon that makes so much contemporary sociology ludicrous; but the contributors—and the editors—do tend to ramble and repeat at some length, sometimes to good purpose, but occasionally not. Liberal use of the blue pencil might well have trimmed 20 to 30 per cent of the wordage (but not any of the voluminous and useful bibliographies) without any lowering of the intellectual calorie count.

But as large as this volume may be, there are still certain omissions to be questioned, even conceding the avoidance of matters of population policy, applied demography, or "social engineering." It is all very well, though somewhat tedious, to have detailed, parallel accounts of the history and present condition of demography in France, Great Britain, Germany, Italy, India, Brazil, and India; but why not also have some report on demographic thought in the Communist nations, even if only at second hand? The single paragraph on current developments in China by Irene Taeuber is hardly adequate coverage of a subject which, however uncongenial, is certainly important. The omission of any treatment of political science and demography in Part IV ("Population Studies in Various Disciplines") is a glaring one; and if we are to have a chapter on "Physical Anthropology and Demography," why not one also on social anthropology? I also regret the absence of any explicit treatment of historical demography, i.e., the study of past changes in population numbers and characteristics, although much information on this score is woven into the discussion of other matters.

Even though *The Study of Population* can be read profitably in its entirety by geographers, certain papers are of especial interest. Edward Ackerman's account of "Geography and Demography" is rather brief and perfunctory; indeed, the fact that this is the shortest contribution contained in Parts III and IV may be significant—an indication of the marginal and anemic condition of population geography. On the other hand, Ackerman's discussion of "Population and Natural Resources," one of the most brilliant and stimulating items presented, is an original, carefully balanced approach to "the" population problem that may well come to be considered one of the classic statements in the literature.

The two chapters that are potentially most geographic in content are, perhaps not too oddly, composed by sociologists: Donald Bogue's on "Population Distribution" and Duncan's on "Ecology and Demography." Bogue's conception of the field of population distribution is curiously lopsided and sociological in focus; and, in format, his rather programmatic paper departs considerably from the others in this volume by saying very little about the past or present status of the subject (and nothing about the labors of geographers) and presenting instead a brief for the particular sort of research Bogue himself has been so energetically pursuing. His paper on internal migration is, however, much more consonant with the purpose of the book and both illuminating and provocative. Duncan's inquiry into "human ecology," as troublesome a term as has ever appeared in the vocabulary of social science, is even more disquieting than Bogue's pronouncement on population distribution. Although the paper is scholarly, well written, packed with flashes of insight, and pregnant with ideas for future research—and painfully to the point on certain derelictions of geographers—Duncan never does get around to defining "human ecology" explicitly. By inference and example, it would appear, however, that it includes any and all areal aspects of social phenomena. It is all too clear that both Bogue and Duncan are treating essentially geographic topics by means of nongeographic techniques and that, although they are to be commended for their zeal in attempting to fill the distressing void that lies between certain phases of geography and sociology, the results of such crypto-geography are not altogether encouraging. The sociologist would be equally dismayed if geographers were to analyze social process and change without reference to sociological method. In the case of population studies, where few geographers have as yet gone much beyond the most elementary sorts of work, the impatience of the demographer to get on with the job of areal analysis is understandable; but the failure of the "human ecologist" to exploit more than intermittently the considerable body of research turned out by geographers in the field of urban studies is rather puzzling. Although the inter-disciplinary approach is essential for ultimate

success in understanding demographic and urban phenomena, this approach implies a constant exchange of ideas and information and a high degree of mutual stimulation rather than deep and ineffectual forays by geographers, sociologists, or economists into one another's territories.

It can be concluded from the foregoing that *The Study of Population* is a unique and unclassifiable book. It is not a textbook and even less a manual of demographic techniques (several adequate ones are already on the market); it is not a routine attempt at stock-taking; and it is certainly not a haphazard compendium of miscellaneous information. Rather it is a reasonably comprehensive, well integrated, and strongly critical colloquium on the state and development of the science, a series of probes along its outer limits, and a set of programs for its future progress. As far as its utility for the classroom is concerned, it is clearly beyond the reach of the undergraduate mind and too advanced for all but the most promising graduate students. The most rewarding use to which this collection of essays addressed by advanced scholars to their equals can be put is as a reservoir of fresh ideas for the research worker penetrating any of the frontiers surrounding this wide-ranging field. Since it is unlikely that anything of equal scope or merit will appear for many years to come, anyone who is seriously interested in the geography of population would do well to familiarize himself with this worthy study.

WILBUR ZELINSKY

Southern Illinois University

Man in Malaya, by B. W. HODDER. 144 pp.; maps, ills., diagrams, tables, bibliogr., index. University of London Press, London, 1959. 12/6d net. 8¾ x 5½ inches.

Some recent regional geography is beginning to fit outlines to regions in a realistic attempt to depict human occupation of regions, rather than fitting regions to outlines set up as theoretical approaches to geographical description. *Man in Malaya* is one of the better short attempts to depict the story of man and environment in a relatively small region. Out of 120 pages of actual working text B. W. Hodder has composed 11 chapters in a two-part book, using in all 25 maps or diagrams, and a few photos and statistical tables. Part I, measuring about two-thirds of the text, sets forth a brief but significant statement on the primary subjects of interest. A review of the landscape comes first, in which headings lead a reader very briefly to consider salient points about landforms and vegetation, geology and soils, and climate. Two chapters consider population, the first in historical context and the latter in terms of ethnic composition and distribution. In one simple and short chapter the economic life of the country is neatly and effectively portrayed. Two chapters are devoted to settlement patterns, one dealing with rural matters and the second with urban patterns. The last chapter of Part I considers the politico-ethnic aspects of the Malayan scene, composed as it is of Malay, Chinese, Indian, and British elements.

Part II comprises four short chapters which, in 42 pages, consider specific relationships between human occupation and the Malayan environment. The first discusses chiefly tropical climate and mental and physical energy, and the ways in which clothing and architecture may be fitted to existing conditions. A second chapter reviews the problems of water for crop growing, for rural domestic use, and for urban supply. Another chapter deals with soil erosion, flooding, and the problems of sedimentation consequent upon a variety of historically applied systems of land use. The last chapter of Part II reviews questions of health, disease, and diet by examining the changing conditions of the last two centuries relating to specific diseases, food patterns changing with mechanization, and the development of urban and rural public health programs.

The usual preliminary materials occupy a few numbered pages at the front of the volume, and a bibliography, glossary of local terms, and an index fill out the total of a slim volume that reaches numbered page 144. A few slight failures of authoring and editing mildly fluster a reader, and one unfamiliar with Malayan localities will wish for a better general map than is provided. There obviously are subjects not dealt with in this short volume, but the sins of commission and omission are relatively slight and not serious.

What is important about this volume, and what makes it interestingly informative is the simple but effective approach to man and region. Here is no standard checklist of categories of material supposedly a part of all regional geographies presented because they must be but then not used in analysis. The volume concentrates on different aspects of life in Malaya, and in so doing it does not try to be "scientifically geographic" or "academically comprehensive." Hodder is concerned with the two-way interaction between man and environment, and he has pointed his materials fully in this direction. By discarding some subjects in the checklist and by adding some materials not in the older lists, he has produced a volume that, for all its brevity, brings Malaya alive and real in the human geography sense.

One learns that poor soils do not necessarily condemn agricultural output, that the chief Portuguese legacy to Malaya was the mixed-marriage ethnic community that continues to live in Malacca, that the Chinese perpetuate

in Malaya the same kind of regional communalism that earlier marked them in south China, that much of the remaining forest-jungle is in no immediate danger of being cut away, and that Malay housing is more efficient in the tropical environment than is Chinese housing, but that neither is functionally related to the agricultural economy, as is supposed to be the case in Europe. Malays suffer from the climate just as Europeans do, but arrange their housing and clothing to better advantage when they have the freedom of choice to do so. The concept of "civilized living," imported wholesale from England, needs modern reassessment with the Malayan environment in mind.

Though the annual rainfall is great, several crops suffer from too little water, examples being rice and market vegetables, whereas the chief problem associated with rubber growing is to secure adequate drainage. Domestic water shortage in areas of heavy rural settlement is significant in a day when the rural populace has become well indoctrinated by public health propaganda, and the diagram of linear movement for securing domestic drinking water in a rural locality is one of the more interesting in the volume. In revamping the natural landform, by engineering and bulldozers, modern technology has reintroduced a trail of malaria by altering the micro-ecology of local sites. Though one possibly can account for the use of spices by the Malayans as an unwitting effort to bolster the B vitamin content of the diet against the supposedly enervating effect of tropical climate, Malayans spice their food because they like it spiced, and because spiced foods do not spoil so easily in a tropical climate.

This is an excellent study, and an admirable addition to the literature of regional geography. It attempts only a limited segment of the whole geography of Malaya, concentrating on man in the environment, but it does so thoughtfully and imaginatively, working both backward in time and into the future, suggestively. In that it does not attempt everything, dully by rote, it succeeds very nicely in drawing an interesting and significant picture of men of different cultures living together in a distinctive environment. Its basic concept needs to be used by others concerned with regional geography.

J. E. SPENCER

University of California, Los Angeles

A Framework for Urban Studies: An Analysis of Urban-Metropolitan Development and Research Needs, by COLEMAN WOODBURY. 29 pp. A Report to the Committee on Urban Research, Highway Research Board. Special Report 52, Highway Research Board (National Academy of Sciences—National Research Council Publication 722), Washington, D. C., 1959. $1.20. 9½ x 7 inches.

In this brief report Professor Woodbury attacks the complex subject of needed urban research. The primary, broad purpose of the study is to furnish an improved understanding of growing urban areas. More immediately, it is designed to provide an overall framework within which urban research projects can be fitted and correlated, and priorities determined. It is only natural, in view of the interests of the parent organization, the Highway Research Board, that primary emphasis is placed on the urban problems related to transportation.

"The report . . . is not a technical discussion of research design and methods. . . . Rather, it attempts (a) to point out the scale, complexity and significance of current urban-metropolitan growth and development; and (b) to outline a number of major areas of urban study that add up to a significant program and that might properly be endorsed and encouraged by a Committee associated with the Highway Research Board."

The discussion of urban growth and urban problems that follows is well worth reading, and Professor Woodbury's list of specific suggestions for research cannot fail to stimulate any student of the city. Some of his suggestions are outside the province of the geographer, even if he has specialized in the urban phases of his discipline, but other topics are definite challenges to the urban geographer.

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